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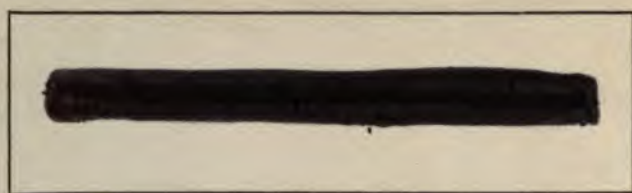
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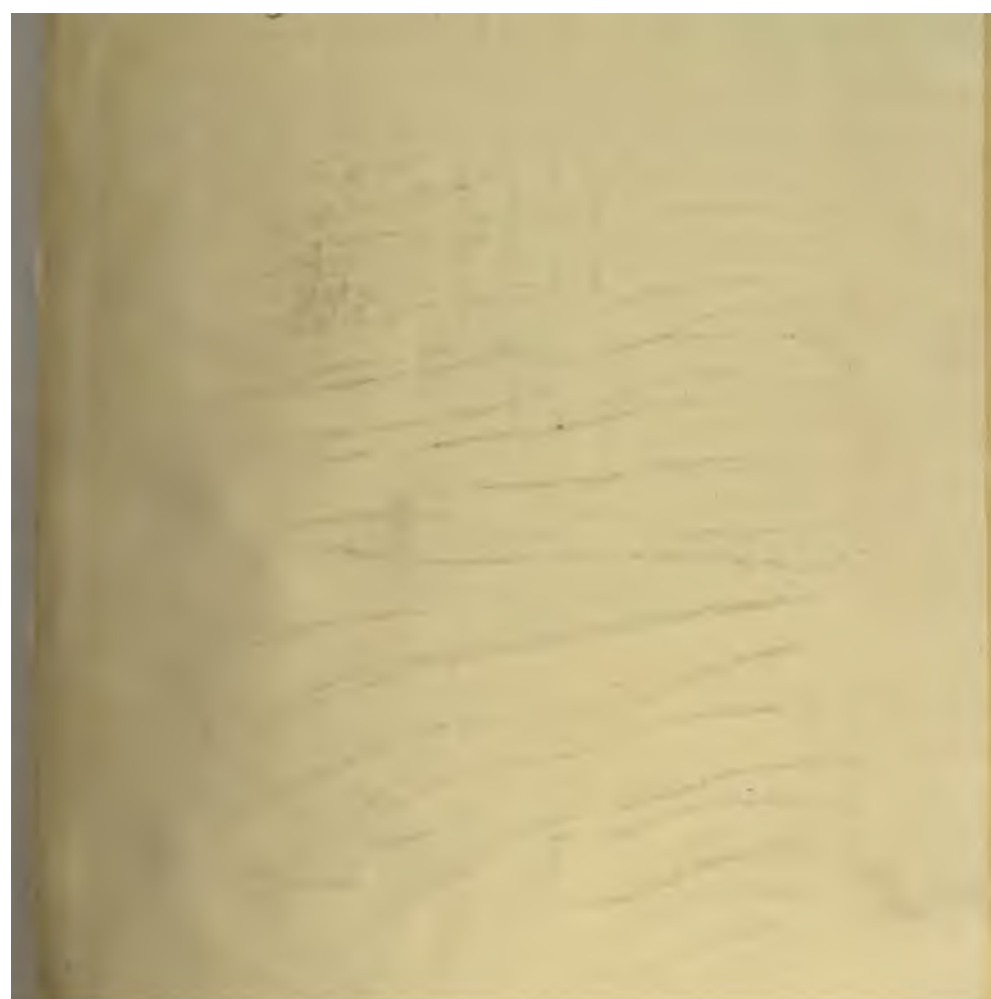
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LELAND STANFORD JUNIOR UNIVERSITY



1892-1900

The

1892-1900

Geographical Journal

INCLUDING THE PROCEEDINGS OF THE ROYAL GEOGRAPHICAL SOCIETY.



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1892-1900

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CONTENTS.

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No. 1. July.

	PAGE
Address to the Royal Geographical Society. By Sir Clements R. Markham, K.C.B., F.R.S., President	1
The Patagonian Cordillera and its Main Rivers, between 41° and 48° South Latitude. By Dr. Hans Steffen	14
In the Heart of Borneo. By Charles Hose, Resident of the Baram District ..	39
A Journey from Chesterfield Inlet to Great Slave Lake, 1898-9. By David T. Hanbury	63
A Journey from Lake Naivasha to the Victoria Nyanza. By Captain G. H. Gorges, of the Uganda Rifles	78
Admiralty Surveys during the Year 1899	90
Observations on the Aurora Australis. By Henryk Arctowski	92
Baron Toll on New Siberia and the Circumpolar Tertiary Flora. By P. Kropotkin	95
The Monthly Record	98
Obituary	114
Meetings of the Royal Geographical Society	115
Geographical Literature of the Month	118
New Maps	134

MAPS AND ILLUSTRATIONS.

Osorno Volcano, from a Lava-field near the Western Extremity of Lake Todos los Santos	17	Warriors prepared for the <i>Jawa</i> ..	50
Valley of River Alanso near its Junction with Puelo Valley (looking South)	21	Punans at Home	53
Narrows of River Alanso (looking North)	25	Dayak Gutta Hunters	57
River Chubut in Alaiten Valley and the Water-parting Cordilleran Ranges (looking West)	29	Sotik Spears	81
River Cisnes, 10 miles from its Mouth	33	Sotik Knives	81
Primæval Forest in the Central Cisnes Valley	37	Sotik Head-dresses	82
Limestone Cave — Haunt of the Swifts	41	Sotik Girl's Apron	82
Jungle in the Kayan District	43	Sotik Hut	84
Madangs on a Jungle Path	45	A Kach Village	86
A Madang Tomb	47	Native Bridge	88
Madangs shooting with the Keleput (Blowpipe)	49	Sketch-map of the Patagonian Cordillera	140
		Map of the Baram District, Sarawak, Northern Borneo	140
		Sketch-map — Chesterfield Inlet to Great Slave Lake	140
		Sketch-map illustrating a Journey from Lake Naivasha to Victoria Nyanza	140

No. 2. August.

Journeys in Central Asia. By Captain H. H. P. Deasy	141
Through Africa from the Cape to Cairo. By Ewart S. Grogan	164
The Patagonian Cordillera and its Main Rivers, between 41° and 48° South Latitude. By Dr. Hans Steffen	185

	PAGE
Ancient Trading Centres of the Persian Gulf. By Captain Arthur W. Stiffe, R.I.M.	211
Dr. Jovan Cvijić's Researches in Macedonia and Southern Albania	215
The Monthly Record	220
Obituary	236
Correspondence	238
Meetings of the Royal Geographical Society	241
Geographical Literature of the Month	242
New Maps	261

MAPS AND ILLUSTRATIONS.

Snow Bridge on Dras River	143	Baker Channel, from a Harbour in its Central Part (looking South-west)	195
Camp Scene in Tibet	147	River Baker in its Lower Course (looking South-west)	199
Glacier near Nabo La Pass	151	River Pascua and Lagoon (looking North)	203
Difficult Part of Route through Hunza	155	Mausolia near Bandar 'Abbas—the highest about 30 feet high . .	212
Scene in Raskam	159	Lake Prespa, 1: 250,000	216
Peculiar Formation in Asgan Sal Valley	161	Lake Ochrid, 1: 250,000	217
The Volcanoes from Lake Kivu; View from South-east	167	Cape Blanco and Adrar Region . .	226
The Volcanoes Mount Götzen and Mount Sharp, from the North-east	171	Muni River Region	226
The Geysers, Albert Edward Nyanza	175	Lower Ganges Region	239
Ruwenzori, from the West	179	Geological Section from Supposed Ancient Crater to Calcutta and on to Kerpo	240
The Swamps of the Dinka Country	181	Sketch-map of Central Africa between the Region of Lake Tanganyika and Albert Edward Nyanza	264
River Aisen near its Mouth (looking West)	187		
River Mañuales near its Origin (looking North)	191		

No. 3. September.

Studies in the Anthropogeography of British New Guinea. By Prof. Alfred C. Haddon, SC.D., F.R.S.	265
King Menelek's Dominions and the Country between Lake Gallop (Rudolf) and the Nile Valley. By the late Captain M. S. Wellby, 18th Hussars	292
Through Haiti. By Hesketh Prichard	306
New Light on some Mediæval Maps. By C. Raymond Beazley, M.A. . . .	319
Methods of Survey employed by the Chilean Boundary Commissions in the Cordillera of the Andes. By Prof. A. Bertrand (University of Santiago, Chile)	329
The Monthly Record	345
Obituary	358
Geographical Literature of the Month	359
New Maps	377

MAPS AND ILLUSTRATIONS.

Sketch-map of British New Guinea	267	Distribution of Cephalic Index of over 78	289
Geological Sketch-map of the Mekeo District	268	Koiari Men of the Village of Makabiri	291
Wavy-haired Boy, Sinangolo, Rigo District	270	Road to Turglan, Haiti	311
Sketch-map of the Mekeo District	272	Matthew Paris' Map of England: Final Form	321
Three Gaile Natives: Motu Stook	279	Dr. Jankó's routes between the Ob and the Irish	347
Tree House, Gasiri, Central District	283	Sketch-map of a Journey from Addis Abeba to the Sobat River	380
Sketch-map of the Rigo District	285		
Village of Kalo	287		

CONTENTS.

vii

No. 4. October.

	PAGE
The <i>Southern Cross</i> Expedition to the Antarctic, 1899-1900. By C. E. Borchgrevink	381
The Anthropogeography of British New Guinea. By Prof. Alfred C. Haddon, SC.D., F.R.S.	414
Geography at the British Association, Bradford, 1900	441
Political Geography and the Empire. By Sir George S. Robertson, K.C.S.I. ..	447
The Origin of Land-forms through Crust-torsion. By M. M. Ogilvie Gordon, D.SC., PH.D., LL.D.	457
The Pettersson-Nansen Insulating Water-bottle. By Hugh Robert Mill, D.SC., LL.D.	469
The Monthly Record	471
Obituary	481
Geographical Literature of the Month	482
New Maps	496

MAPS AND ILLUSTRATIONS.

Cape Adare in winter-time	384	Shield and ceremonial or magical tablets	434
Thermometer Screen	385	Carved wooden belt from the Papuan Gulf	434
Camp Ridley after the first snowdrift	387	1. Frigate-bird scrolls carved on a club; 2. Dancing shield with frigate-bird designs; 3. Lime gourd with burnt design	435
Dugdale Glacier (Mouth of)	389	Linguistic Map of the Central District	438
Starfish found in 20 fathoms at Cape Adare	392	Fig. 1.—Bending and warping of a lath loaded at the centre with a weight	457
Part of the medial moraine at Geikie Land	394	Fig. 2.—Bending and warping of a lath subjected to end compressions	458
Reindeer Moss (lichen)	395	Fig. 3.—Wedges of Lower and Middle Trias above the plane of overthrust in Buchenstein Valley	462
A typical Antarctic Iceberg	399	Fig. 4.—Slabs in Schlern dolomite rock, produced by cross-pressures: Spitzkofl group from Gröden Pass	463
Distribution of Initiation Ceremonies, etc.	418	Fig. 5.—Portion of the eastern transverse arch of Sella Mountain in the Dolomites	464
"Fulaari," or Masked Executive of the Taboo, Waima, Mekeo District	419	Fig. 6.—Portion of the western transverse arch of Sella Mountain, in the Dolomites	465
Bull-roarer and Ceremonial Masks from Karana	420	Fig. 7.—Differential strains	466
The last round house in Mer (Murray Islands)	422	Fig. 8.—Resultant wave-form	468
Distribution of Houses	423	Fig. 1.—Pettersson-Nansen water-bottle descending, set and ready for use; Fig. 2.—Ditto ascending, closed and locked	470
Houses in coconut grove, Nada	424	Map of a Part of the Coast-line of South Victoria Land	500
Distribution of Canoes	426		
Distribution of Bow and Arrow, Spear, etc.	428		
Pottery-making at Hanuabada, Port Moresby	429		
Distribution of Decorative Art	430		
Carved wooden belt, Papuan Gulf; "Geometric" patterns on wooden comb from Mer, Torres Strait ..	431		
Rubbing of part of the foliar decoration of a drum from the Fly River; Drums from Daudai ..	432		
1. "Geometric" patterns burnt on a bamboo tobacco-pipe; 2. Prow of a canoe carved with heads of the frigate bird, Massim Region ..	433		

No. 5. November.

Journeys in Central Asia. By Captain H. H. P. Deasy	501
An Orographic Map of Afghanistan and Baluchistan. By Colonel Sir T. H. Holdich, K.C.I.E., C.B.	527
A Journey through South-West Szechuen. By Edward Amundsen	531
The Emerald Mines of Northern Etbai. By Donald A. Mac Alister	537
The Dutch <i>Siboga</i> Expedition to the Malay Archipelago	549

	PAGE
The Monthly Record	552
Correspondence	569
Geographical Literature of the Month	569
New Maps	592

MAPS AND ILLUSTRATIONS.

View of Kwen Lun Range, from Shor Kul	505	View of Wadi from Jebel Sikait ..	543
Glaciers near Sources of Kiria River	509	Small Shrine in the hills between Wadi Nugrus and Wadi Sikait, out in the soft rock	544
General View of Sources of Khotan River	513	Abbadi Natives	545, 546
The most Westerly Bend of Yarkand River, taken from the Mouth of the Mariong Valley	517	Bathymetric Chart of the Malay Archipelago	550
Map of the Sikait District	538	Map of part of Tibet and Sin-Chiang (Chinese Turkestan)	596
In the Desert: halfway to the Mines	539	Orographical Map of Afghanistan and Baluchistan	596
Plan of Mined Area between Wadi Nugrus and Wadi Sikait	540	Sketch-map of part of South-Western China	596
Plan of Jebel Sikait, showing position of mines	540	Survey of a Route from Um Selim to Sikait	596
Jebel Sikait from the west	541		
Roman Hill, Jebel Sikait	542		

No. 6. December.

The President's Opening Address, Session 1900-1901	597
An Expedition between Lake Rudolf and the Nile. By Dr. A. Donaldson Smith	600
The Voyages of Diogo Cão and Bartholomeu Dias, 1482-88. By E. G. Ravenstein	625
The Oases of the Mudirieh of Assyut. By A. R. Guest	655
The Danish East Greenland Expedition in 1900. By Lieut. G. C. Amdrup, R.D.N.	662
On the Afghan Frontier: A Reconnaissance in Shugnan	666
The Monthly Record	679
Correspondence	691
Meetings of the Royal Geographical Society	693
Geographical Literature of the Month	694
New Maps	707

MAPS AND ILLUSTRATIONS.

On the Omo at Mursu	603	Oasis of Kharjah	658
Bad Sands, near Saki, east of Lake Stefanie	605	Town of Mut, Oasis of Dakhilah ..	659
<i>Gazella Grantii Brightii</i>	607	General View of Kasr Dakhil, Oasis of Dakhilah	660
Mursu on the River Omo	610	Ruined Temple, Smint el Kharab ..	661
Cedar Valley	612	Sketch of the Course of the <i>Antarctic</i> and of the Coast-Expedition in 1900	662
A Magois Youth	613	Cape Garde, on Blossonville Coast	663
Near Magois	615	Cape Christiansen, 67° 13' N. lat. ..	664
Raffia Palms, Country of the Akara	617	View from the North Side of Kaugerdlugsuak	665
<i>Tragelaphus Bor</i> (Heuglin)	619	A Small Glacier East of Kaugerdlugsuak	666
The Nile at Fort Berkeley	623	Auroral Curves in the Antarctic and in Canada	692
The Arms of Portugal up to 1485 ..	628	Map to illustrate Explorations in North-East Africa	712
The Padrão of São Jorge	630	Maps illustrating the Voyages of Diogo Cão and Bartholomeu Dias	712
The Coat-of-arms of D. Cão, 1484 ..	632		
The Padrão of Cape Cross	634		
The Royal Coat-of-arms, 1485	634		
Fragments of a Padrão of B. Dias, 1487	642		
Sketch-map of the Oases of Assyut	656		
Er Ramlah el Kabir, on the Assyut Road to Kharjah	657		

The Geographical Journal.

No. 1.

JULY, 1900.

VOL. XVI.

ADDRESS TO THE ROYAL GEOGRAPHICAL SOCIETY.*

By Sir CLEMENTS R. MARKHAM, K.C.B., F.R.S., President.

THE events of the year have turned attention more to the splendid valour of our troops in resisting an invasion of the Queen's colonies than to peaceful geographical labours. But our science, in one branch or another, is always in requisition, and never more so than in warlike operations. The deficiency in accurate topographical maps has been, at times, a serious impediment to the advance of our armies; and I am glad to know that the attention which was called to this serious want by Sir Thomas Holdich, in his paper read before the United Service Institution, has resulted in the question of the execution of timely surveys in all our colonies being taken into consideration by the authorities, in a way which is likely to lead to action. Sir Thomas pointed out that, in order that reliable military maps might be at hand when required, there should be a carefully trained Survey Department for field work in every colony, consisting partly of natives. Upon the basis of their surveys, maps would be constructed for administrative and political purposes, while a thoroughly efficient corps of local surveyors would accompany a general's staff in time of war.

In the present operations in South Africa, the Fellows of this Society are leading our armies to victory, and serving usefully and gallantly in great numbers. Our old and respected associates, Lord Roberts and Lord Kitchener, are showing that a geographical instinct is one of the requirements for a successful general. Sir Charles Warren, formerly on our Council, is also doing good service; and, among many others, I may mention Major Grant, but recently on our Council, to whom the only

* Read at the Anniversary Meeting, May 21, 1900.

bit of really accurate mapping in South Africa is, I believe, due; and Captain Wellby, who went through the siege of Ladysmith, and whose interesting paper on his journeys from Abyssinia to Khartum will be read this session. That all the many Fellows of this Society now at the front, from Lord Roberts through all ranks, may pass safely through the perils and hardships of this most righteous war, and be restored to us in due time, is, I know, the earnest prayer of us all.

We have done our best, now for a considerable number of years, to train and instruct military men and others, in order that their usefulness may be increased when on service in distant countries, both in time of peace and during warlike operations. Our system of instruction has been most successful, and our diplomas are now highly valued. It may well be that it might be improved and extended, and that it may become a still greater success, but we must always remember to whom we owe all the progress that has hitherto been made. Mr. Coles, I deeply regret to have to announce, has been obliged to retire on account of ill health. It would not be possible for me to overestimate the value of his services to this Society, or to express to you fully my deep sense of the merits of our friend. For twenty-three years he has been our map curator, and for twenty years he has been our scientific instructor. Accomplished in all the knowledge required in his position, diligent, methodical, and painstaking, I observed in him also, during his long period of service, a strict sense of duty and an integrity of purpose which, in my belief, bore hardly on his physical powers. His courtesy to the numerous visitors to the map-room, and the trouble he was always ready to take in order to satisfy inquiries, is within the experience of many here present. Of his rare gifts as a teacher I can speak from knowledge, for I have myself been his pupil, and my testimony will be borne out by many others. He was luminous and clear in his explanations, always ready with help, always patient. Among all his pupils, from the Viceroy of India to the youngest traveller that has benefited from his instruction, the regret at his retirement will be heartfelt and sincere. It has grieved me to see Mr. Coles working on for the Society when he ought to have been giving himself complete rest. I blame myself for not having insisted on his sparing his sinking frame in the last year or two, and I feel now that he has seriously injured his health by his single-minded zeal for our interests. I am sure that the warmest wishes for his welfare from all the Fellows of this Society will follow Mr. Coles in his retirement.

Mr. Coles will be succeeded as map curator by Mr. Reeves, who has served as his assistant for over twenty years, and who, like his chief, has been long known to visitors of the map-room, for his courtesy and his knowledge of cartography.

The new edition of 'Hints to Travellers,' edited by Mr. Coles, is practically completed and in print, and it is hoped that it will be ready

for publication by the end of the year. It will be issued in two volumes. The first will contain the section on surveying and astronomical observations, with the necessary tables; and the second will consist of the other sections, which, in the previous editions, have been given in the latter part of the single volume. Each volume will be in so compact a form that it can be carried in a traveller's pocket. The remarks and advice on outfit will be issued as a separate pamphlet.

The instruction in all that is contained in the 'Hints to Travellers' is given in our own house. Our other measures taken for the advancement of geographical education are now connected with one of the Universities. We give substantial financial support to the new Oxford School of Geography, which is assisted with equal liberality by the University itself. This institution has now been at work for six months, under the superintendence of Mr. Mackinder, with encouraging success. Mr. Mackinder is assisted by Mr. Herbertson, Mr. Dickson, and Mr. Grundy. The various lectures have been largely attended. A certain number of students are going through the complete course of geographical training; and a substantial beginning has been made in the collection of a special library, and towards an equipment of suitable instruments and other apparatus for practical work. There is every reason to hope that the Oxford University will institute a diploma in geography, which cannot fail to be an inducement in attracting students, and should give this very important subject a substantial place in the University curriculum. At Cambridge Mr. Yule Oldham, in addition to his usual courses of lectures, has been delivering a series of lectures on the history of geographical discovery, which has attracted great audiences. On the whole, the Society has cause to be gratified with the results which have so far attended its efforts to improve the position of geographical teaching in this country.

The Geographical Association is also doing good work. Its President is our former able secretary, Mr. Douglas Freshfield, and under his auspices the Association is doing much to improve methods of teaching in schools, and to provide apparatus. It is an Association which all teachers would do well to join.

Our own great work during the last year has been the completion of the Subjects Catalogue up to 1893, comprising more than 100,000 card titles. These have now been arranged in 160 boxes, classified according to localities and subdivided according to subjects. The boxes are arranged in a special case in the librarian's room; where are also the boxes containing the 20,000 card titles covering the accessions from 1893 to the date of issue of the last number of the *Geographical Journal*. All these are available for the use of Fellows; but the large number of cards under each heading, and the risk of misplacing cards in returning them to the boxes, makes it necessary that any consultation of the catalogue should be carried out by the librarian or one

of his assistants. While the classification of the cards is complete as far as regards the different countries of the world and their subdivisions, there are many cross-references to be filled up before the work can be looked upon as absolutely finished. The question of printing the catalogue is a very serious one, and I have not ventured even to think of it as a practical one. If it was printed in a form similar to the present Authors Catalogue, the entries, including cross-references, would number about 160,000, and, on the moderate average of three lines to a title, the whole would require 3810 pages in double columns, or five volumes as large as the present Authors Catalogue. The printing would cost £2000, and the copying of the cards for the printer, and correcting proofs, would amount to several hundred pounds more. This is out of the question in the present state of our finances, and will be for some time to come. Meanwhile this great work is accessible for geographical students. Our zealous librarian, Dr. Mill, well deserves the thanks and congratulations of the Fellows; for I do not believe that there is anything so complete and exhaustive, and so valuable for those engaged in geographical research, to be found elsewhere.

At the suggestion of our colleague, Sir Cuthbert Peek, to whom this Society owes much in other ways, we are doing for our collection of photographs what has already been done for the publications in the library. The Society's collection of photographs now numbers something like 20,000. These are all arranged in boxes according to their subjects, and hitherto they have been only catalogued under general headings; now we are compiling a general card catalogue, in which every photograph is entered with its title, under a series of headings and sub-headings. The immense utility of such a catalogue will be evident, both in enabling any required photograph to be quickly found, and in providing photographs for purposes of preparing slides for lectures.

I need not remind you that our Society does its best to issue maps of previously unmapped or unexplored portions of the world. I referred in the beginning of the session to the map of Siam, by our gold medallist, Mr. McCarthy, as being in progress. I am glad to be able to announce that it is now completed and published. It is a credit to its author, and to the Siamese Government, under whose auspices the work was carried out, and at whose expense the map has been beautifully produced on copper. Besides this, as those of my associates who examine our *Journal* will admit, the Society, during the past year, has made many important and beautiful additions to cartography. I may mention especially the maps illustrative of the researches of Sir John Murray and Mr. Pullar into certain of the lochs of Scotland.

Our *Journal* still continues to maintain its position, and I have the means of knowing that it is held in very high esteem by the geographers of the world, both for the fulness and the accuracy of the information

it contains, and for the ability with which it is edited. This success, which is due to the unwearied diligence of our accomplished secretary, Dr. Scott Keltie, merits our recognition and acknowledgments. The Paris Geographical Society has this year recognized the merits of our *Journal*, by following our example, and issuing a monthly Geographical Journal instead of the *Bulletins* and *Comptes Rendus* of the past. The French journal is issued in a very handsome form, and is certainly a decided step in advance. I congratulate our French colleagues on the improvement they have made in the form and arrangement of their valuable and interesting publications.

The plan, brought forward by Dr. Mill in April, 1896, for a geographical description of the British Islands to illustrate and accompany the sheets of the Ordnance Survey was cordially welcomed by me at the time, and received almost universal approval from all the authorities to whom it was submitted. Further consideration has quite convinced me of the value and importance of Dr. Mill's proposal. Its chief feature is that the treatment should be exclusively from the geographical standpoint; and hence the memoir for each sheet, as well as a county history condensed from the sheet memoirs, would be more methodically and scientifically treated than has ever been attempted before. The value of such memoirs for national and secondary schools would be very great, for they would give the student that thorough knowledge of his own geographical surroundings which is essential to an accurate understanding of physical aspects over more extended areas. Nor would their usefulness cease with educational purposes. Almost every occupation in life would be advanced by the assistance to be derived from knowledge arranged in this form.

I have, on several occasions, striven to impress upon the minds of local audiences the fact that geographical researches may be made within the range of a few miles of their own homes, and that there can be no better training for a geographer than the study of the various branches of inquiry which are comprised in our science, within his own river-basin. Dr. Mill brought his excellent scheme into practical operation by selecting the sheet of the Ordnance Survey comprised in south-west Sussex, and carrying out researches on the plan sketched out in April, 1896. The result was given to us in the very interesting paper read at one of our meetings in February. I must say that I should be pleased to hear of that paper being read at Chichester and other places in the chosen Ordnance sheet, in order that a local interest might be aroused in the subject within the selected area. For it is by the formation of such small centres of interest that a whole mass is leavened, and it is thus that steady advances in the varied pursuits and objects which are included in human progress are secured. The preparation of such memoirs for all the sheets of the Ordnance Survey is far beyond the resources of this Society; but the

Council is desirous that so useful a project should not be lost sight of, and will do what is possible to secure that end. Our first step has been to make a representation to the department most interested in the matter, to ascertain whether there is any hope of assistance from Government for an object which appears to us to be of national importance.

A relic of great interest, which has recently reached England, is a section of the tree under whose shade Dr. Livingstone's heart was buried, with the inscription carved by the great explorer's native followers. It is nearly two years since Mr. Alfred Sharpe, the Administrator of British Central Africa, kindly undertook, at the request of the Council, to procure this interesting relic for the Society. As he was unable to proceed to Lake Bangweulu himself, he requested Mr. Robert Codrington, an official of the British South Africa Company, who was undertaking an expedition in that direction, to carry out the work for him. Mr. Codrington did this most successfully, and without any cost to the Society, though of course the Council originally expressed its willingness to bear any reasonable expense. The thanks of the Society are due to the Company for their generous aid in conveying the section of the tree from Lake Bangweulu to England, and sending it to the house of the Society. I may further state that a committee has been formed, consisting of representatives of the Council and of a movement in which Sir Henry Stanley has taken a leading share, to obtain funds for the erection, on the spot where the tree stood, a suitable memorial to Dr. Livingstone. This plan is so far advanced that, in the course of a week or two, the materials will be sent out from this country with which to erect a handsome obelisk 20 feet high, surmounted by a cross, with bronze plates let into the face having suitable inscriptions; the materials will be conveyed free of expense from the mouth of the Zambezi to Lake Bangweulu, by the kindness of the African Lakes Corporation and the British South Africa Company. Every means will be adopted to render this memorial impervious to deteriorating effects of the climate. The section of the Livingstone tree is at present in a case in the map-room.

Here I think I ought to bring the fact to your notice that every year we are becoming more and more hampered for want of space in the Society's house. We have constantly to decline accepting curiosities of geographical interest from various parts of the world, simply because we have no suitable place in which to display them. If the Society had the accommodation which it ought to have, we might possess the finest geographical museum in the world. As it is, we are compelled to scatter our library all over the house, at much inconvenience and some risk, while the fact that we have no proper meeting-place of our own hampers us in many ways. The question of obtaining suitable accommodation for the Society will, before very long, become a very pressing one.

One of the most striking journeys of the past year has been that accomplished by Mr. Grogan, who has, for the first time, actually traversed the centre of Africa from the Cape to Cairo. He was accompanied part of the way by Mr. Arthur Sharp. The journey was a remarkable feat, but it was a great deal more. For Mr. Grogan has brought back much valuable information respecting the remarkable region round Lake Kivu and on the eastern shore of Lake Albert Edward, as well as concerning the Dinka country to the east of the upper Nile.

The results of Mr. Mackinder's visit to Mount Kenya show how much can be accomplished by a well-trained and observant traveller when he devotes himself to a limited area, even within a very short period.

What with official and unofficial expeditions on the upper Nile and its tributaries, and in the Lake Rudolf region, we may shortly expect many additions to our knowledge of that section of Africa. Our Gold Medallist of last year, Mr. Foureau, has not yet returned from his adventurous journey across the Sahara to Timbuktu, nor can we be sure that he yet knows of the honour which the Society conferred upon him, but we have every reason to hope and believe that he is safe, after escaping from the dangers which at one time surrounded him. Major Gibbons, according to the latest news, had reached Uganda, and is now probably on his way down the Nile. He will be the second traveller to make his way from the Cape to Cairo. Judging from letters received at the Society, it is clear that he has been doing very excellent work in the country which is watered by the feeders of the upper Zambesi, and in the watershed between the Zambesi and the Congo. I hope we shall soon be able to welcome Major Gibbons, when he will tell us his own interesting story in his own way.

From Asia, during the past year, we have had to welcome the return of our Gold Medallist, Captain Deasy, from his two years' most trying but highly successful exploration of a wide region to the east of the Pamirs. Another journey, of which we may hope to receive a more detailed account than we have yet had, was made by Captain Wingate from China to Burma, to a considerable extent by a route not previously traversed. This route was mapped in much detail, and I hope that Captain Wingate's survey may be made available for geographical purposes. News from Major Sykes show that our indefatigable associate is working hard to elucidate the past and present geography of Persia. Mr. Douglas Freshfield has recently returned from an expedition which had for its object an examination of the lofty region over which the great Kiuchiu-junga rises. He was accompanied by Mr. Garwood, and other competent observers; and we may expect, as a result, to have a very interesting study of the physical geography and the glaciation of this section of the Himalayas.

In the arctic regions, Captain Sverdrup and Lieut. Peary are believed to be at work in the channels leading north from Smith sound, and the Duke of Abruzzi has wintered in the region of Franz Josef Land. We may hope for news from some or all of these expeditions next autumn. We also await further news from the Antarctic Expedition of Sir George Newnes.

Dr. Nansen has published the first volume of the scientific results of his memorable Arctic Expedition in English. The whole work will consist of five or six quarto volumes, and will be completed in about two years. The first volume contains five memoirs. The first is an interesting account of the construction of the *Fram* by Mr. Colin Archer. The second is a geological sketch of Cape Flora and its neighbourhood by Dr. Nansen himself, who gives full credit to his companion in geological research, Dr. Koettlitz, the accomplished medical officer of the Jackson-Harmsworth Expedition. The third is on the fossil plants of Franz Josef Land, the fourth an account of the birds, and the fifth of the crustacea by Prof. Sars. The volume is profusely illustrated. The complete work will be a fitting record of one of the most memorable expeditions of the century.

We have had much new and most interesting information from South America during the year, chiefly with reference to the Patagonian Andes. Whole regions, including large lakes, deep fjords, and mountain ridges, all previously unknown, have been described to us, and we have received new and particularly interesting geographical information. Our valued colleague, Dr. Don Francisco Moreno, has shown us a number of valuable maps and photographs, and has read us an extremely instructive paper on the eastern slopes of the Patagonian Andes. Prof. Bertrand of Santiago de Chile, at an afternoon meeting, has fully explained to an appreciative and learned audience his system of surveying a difficult and mountainous country. Dr. Steffen has communicated to us an account of his exploring labours, during several years, on the western or Chilian side of the southern section of the backbone of South America. But the still unsettled question of arbitration makes this region, teeming as it does with points of geographical interest, a somewhat forbidden ground for the present. Maps of the region will, however, shortly appear in the *Journal*.

The prospects of the Antarctic Expedition, from a financial point of view, have been somewhat clouded by the war. Through the munificence of our Fellows, and the liberality of our Council, a sum of upwards of £40,000 was raised a year ago. This enabled the two Societies to invite all leading men of science, as well as arctic officers, to accompany the two Presidents in a deputation to Mr. Balfour, to ask for a grant in aid from the Government. In the unavoidable absence of Lord Lister, it became my duty to present the deputation on June 22 of last year. In reply to us, Mr. Balfour made a most cordial speech, fully recognizing

the importance of such expeditions to science and to the country. He even extended his anticipations of valuable results beyond those which we had enumerated in a very striking passage of his speech. "The things," he said, "which we go forth directly to observe, and with the fore-ordained intention of observing, are doubtless of the highest importance; but I should be greatly surprised if the expedition does not come across a great many phenomena which we did not expect to observe, and which will throw a novel light upon many of our most important scientific theories." Mr. Balfour, with a touch of Ithuriel's spear, threw a still brighter light upon our hopes, and widened almost indefinitely the possible scope of our discovery of new truths. The First Lord of the Treasury expressed his hope that our expedition would be adequately equipped, and his satisfaction that we should co-operate with a German expedition animated by the same scientific hopes as our own. He told us, in conclusion, that the Chancellor of the Exchequer would give substantial aid, sufficient to enable us to send out the expedition in a manner not unworthy of the two great Societies and of the nation.

But the subsequent letter from the Treasury, dated July 3, disappointed us. The sum of £45,000 was less than the lowest we had expected. Not only was it less than our smallest hopes, but it was saddled with wholly unexpected conditions. It would only be granted at all on the condition that not less than an equal amount (or £45,000) was raised from other sources. Moreover, it would only be paid in instalments extending over four years. We had only collected £40,000, and when the time came, at the end of last year, for the first instalment to be put in the budget, we found that the condition must be complied with, or we should lose the grant. £5000 were needed. I made appeals for help, but there was no response. The fate of the expedition was at stake. Then it was that our Council liberally came forward and saved it, by guaranteeing the required amount. All help was denied elsewhere. Our Council altogether will have contributed £8000. It is a very large sum considering the numerous calls upon us, and will necessarily, I fear, cripple our other work for years to come.

Yet I think that we have done right. If we look back at our previous history, we shall see that very great and permanent results have been gained by similar liberality in the same great cause. When we were still comparatively poor, we largely assisted Sir George Back's arctic land journey, we paid for the exploration of Guiana by Schomburgk, of South-west Africa by Alexander, of Kurdistan by Ainsworth, and gave assistance to Beke in Abyssinia. Later we shared equally with the Government in the expense of the expeditions of Burton and Speke, and of Speke and Grant. Our colony of Uganda is the result. We spent many thousands of our capital on the discoveries of Livingstone and the search expeditions. One result was the flourishing colony of Nyasaland. We spent £7000 on Mr. Thomson's expedition,

with most satisfactory results. I cannot doubt that such large expenditure for really great objects is a wise policy, and is desirable for advancing our science. Our present antarctic expenditure is not greater than has, in former years, been disbursed for geographical discovery in Africa on more than one occasion. Certainly our present undertaking is the greatest and the most difficult that our Society has ever entered upon. It is an enterprise which fills the imagination with thoughts of great deeds, and with noble aspirations. It is an enterprise presenting obstacles only to be overcome by very high qualities and rare gifts. It is, therefore, an enterprise fit for English sailors to undertake, and for us to help by every means in our power. For what our Council has done I feel sure of the hearty approval of the Fellows of this great Society. But we need more money, at least £30,000, and when the time is more opportune I shall begin begging again.

Amidst many cold refusals at home and in the Australian colonies, we must return our warmest thanks to the noble colony of Queensland, for having appreciated the value of scientific researches, and for having come forward with substantial aid. Lord Lamington, the Governor of Queensland, is a former member of our Council. The Government is liberal and enlightened, and the Queensland Geographical Society is presided over by Sir Hugh Nelson, from whom I have received the warmest wishes for our success, and the most generous support. Nor can I ever touch upon this subject of liberal help without referring to the munificence of our own associates, foremost among whom are the names of Mr. Longstaff, now a member of our Council, and of Mr. Harmsworth.

Apart from the finances, the affairs of the expedition are in a flourishing state, and everything seems hopeful. Our main object is geographical discovery in an unknown region with an area of 9,000,000 square miles, infinitely more difficult of access than any other region in the world—I mean geographical discovery in its widest sense, embracing terrestrial magnetism, meteorology, and oceanography, as well as the study of land masses and glaciation. But we have the great advantage of being able to divide the labour with the German expedition, with the promoters and leader of which we are on the most cordial terms.

Baron F. von Richthofen, the President of the International Geographical Congress, has been foremost in furthering the objects of the German Antarctic Expedition, and in co-operating with the able and accomplished leader of that expedition, Herr Erich von Drygalski. When I was in Berlin last October, I had conversations with both these eminent geographers, and we arranged a division of labour. For purposes of reference and to facilitate discussion, I divided the circle of the antarctic regions into four quadrants, to which the names of Victoria, Ross, Weddell, and Enderby were given—

The Victoria Quadrant, 90° E. to 180°	} British.
The Ross Quadrant, 180° to 90° W.	
The Weddell Quadrant, 90° W. to 0°	} German.
The Enderby Quadrant, 0° to 90° E.	

Our expedition will direct its efforts to the Victoria and Ross quadrants, south of Australasia and the Pacific; while the Germans undertake the Weddell and Enderby quadrants. Our actual plans cannot be arranged without consultation with the commander of our expedition. The Germans intend, as I understand, to establish a station at Kerguelen island. The ship will then be forced southwards on the meridian of about 70° E., with the object of wintering on the western side of Victoria Land and exploring that region in the spring. In another season, or if the Enderby Quadrant is not found practicable in the first season, the Weddell Quadrant will be undertaken.

The Germans are building their ship at Kiel; all preliminaries have been arranged, and their preparations are in a forward state. The councils of the two English societies and the German committee are most anxious to work in friendly unison and co-operation, and already there has been occasion to have an exchange of views on the subject of the magnetic and meteorological observations, which has been in all respects satisfactory. There will be magnetic stations at Melbourne and at Kerguelen island certainly, and we trust at other places.

As regards this question, our accomplished colleague, Dr. Don Francisco Moreno, has kindly come forward with advice and assistance. He ascertained for me that the Argentine Government was disposed to assist and co-operate with the British and German Antarctic Expeditions in any way in its power. The exact nature of the request has been settled, and identical letters have been addressed to the Argentine ministers in London and Berlin, proposing the way in which their Government might help us, by the establishment of a first-class observatory in a high southern latitude. It is with very great pleasure that I, who have long taken a deep interest in the welfare of the South American Republics, am able to welcome this desire to co-operate with the two European nations for the advancement of science. We in this country, I am quite sure in concert with our German friends, are pleased to receive, not only sympathy, but co-operation from the Argentine Government.

The keel of our exploring ship is now laid at Dundee. She will be the best polar exploring vessel, in every point of view, that has ever left these shores, and the first that has ever been built in this country specially for scientific work in polar regions. Our warmest thanks are due to our associates who have taken so much trouble in preparing the design, more especially to our Vice-President, Sir Leopold M'Clintock, and to Admiral Markham, the Chairman and Secretary of the Ship Committee. Acknowledgments should also be made to Mr. Smith, one of

the chief constructors of the Navy, for the diligent and untiring industry with which he has given us his help. His ability and experience in the construction of wooden ships have been invaluable. We also have to thank Mr. Marrach for assistance connected with the engines.

Lord Lister has consented to preside over a sub-committee, to consider questions connected with provisions and dietary, and with the hygiene of the ship. He has brought together, to advise him, several accomplished and experienced gentlemen, whose assistance will be of great value.

Our colleagues, belonging to both societies, who have been so good as to become members of the scientific sub-committees, are ready with advice and assistance, and several have undertaken work connected with the preparation of instructions and information for our explorers. It will be remembered that, when the Arctic Expedition of 1875 was equipped, a volume on the geography and ethnology was prepared and published at the expense of this Society, and that a larger manual, with instructions, was prepared by a committee of the Royal Society, under the editorship of Prof. Rupert Jones, and published at the expense of the Government—the Blue Book and the White Book. They were not only very useful to that expedition, but also to several subsequent arctic expeditions, as I have been informed by Baron Nordenskiöld. I have been anxious that a similar manual and instructions should be prepared for the Antarctic Expedition, and I am glad to be able to say that the members of our Geological and Biological sub-committees have undertaken such a manual, and have divided the work. The whole will, I hope, be edited by Mr. George Murray of the British Museum.

We shall be able to accommodate three civilians on board for scientific work, and the surgeon will also undertake a branch of scientific investigation, so that the civilian scientific staff will consist of four workers. There will be the same number on board the German ship. The chief of this staff will be our associate, Dr. Gregory, whose valuable papers, read at our meetings, prove him to possess not only learning, but imaginative faculties well under the control of his judgment, and literary powers of no mean order. He is now Professor of Geology at Melbourne, but he has obtained leave from that university to join the expedition.

By far the most important point, however, has been to obtain the sanction of the Admiralty for naval officers to join the expedition. It will be remembered that, when I had an interview with the First Lord of the Admiralty, some time ago, he was unable to hold out any hopes. The speech of Mr. Balfour to the Antarctic Deputation, and the Parliamentary Grant, altered the situation, and I felt that the time had come to make another appeal. One of our colleagues, a distinguished naval

officer and a warm friend to the expedition, was so good as to prepare the way, and, indeed, I believe that his intervention secured our object. I then applied for officers to the First Lord, urging that the situation had been quite changed by the fact that the Government was now a partner, and indeed the largest partner, in our enterprise. The First Lord and the Naval Lords saw the question from the same point of view; and Mr. Goschen informed me that, although it was very difficult to spare lieutenants, he would lend two excellent officers for service in the expedition, one of them to command. Moreover, the Lords of the Admiralty will also let us have two or three officers of the royal naval reserve to complete the executive staff.

This is a great point gained, and we must all feel the consideration and liberality with which their lordships have treated us. For undoubtedly there were difficulties in the way, and the arguments against us were not without weight.

The two "excellent young officers"—I use Mr. Goschen's words—will be untried as regards antarctic navigation. That is inevitable; but they are not untried in many other respects. Skilled in navigation, in seamanship, and in several branches of science, full of zeal and devoted to duty, our young naval commander has all the qualifications for leading a scientific expedition. As a geographer, and as a very old Fellow of both the Societies associated in this enterprise, I hail the appointments with the greatest satisfaction, as calculated to ensure the results we desire; and I feel sure that my feeling is shared by the Fellows of this Society. But we may well rejoice at these naval appointments, not only as geographers and friends of scientific progress, but also as lovers of our country. It is one of our urgent national requirements that the navy should be given opportunities of distinction in peace as well as in war. We have just seen our sailors saving their country from a great peril at Ladysmith. Should we not rejoice at giving them an opportunity to do battle with and to conquer the antarctic ice, as our navy always conquers. Polar voyages are the best training-grounds for our navy in time of peace. Nelson prepared for Trafalgar in the polar regions. The discipline of polar service teaches, as nothing else can, self-reliance, quickness of eye, steadiness of nerve, and the necessity of comradeship. It makes men thinking beings instead of well-drilled machines; more handy, more agile, and more generally useful. These are the very qualities needed in the operations of war. It is from the furious gale, off the frozen lee shore, among the hardships and perils of polar navigation, that Britons learn those qualities which have made so many enemies quail before our unconquered fleets. Even if there is no gain to science, still it is well that our seamen should defy the obstacles of the frozen sea. Most of us must have felt this. One of the Fellows of this Society, now passed away, put it into noble words, when told that polar exploration was useless—

"But be it so. It is from these alone,
 The tempest's murmur and the ice-floe's groan,
 The power to stand unshrinking when the blast
 Shakes the cold sky, careering fierce and fast,
 That England's sons defy the storms of war,
 And the world quails before Britannia's star.
 Still, tho' in vain, may her bold prow explore
 The frozen ocean and the barren shore."

In conclusion, I would remind you that I have now occupied this chair for seven years, a period unprecedented since the days of Sir Roderick. It can at no time be an easy post, nor can it be held without a heavy feeling of responsibility and anxiety. I speak of the President's work alone. But to it has been added the initiation, the raising of funds, and all the other preparations for the Antarctic Expedition. This business has increased until now the President's work is quite doubled. I would cheerfully undertake it all if it was work and nothing more. I have given my whole heart to your interests, and I am sure you know that I shall continue to do so as long as you retain me as your President. I have spared neither time nor diligence. That I can honestly declare. It is for you to say whether the Society's welfare, and the welfare of the Antarctic Expedition in which you have so large a stake, is safe in my hands, and whether I have conducted your affairs to your satisfaction.

THE PATAGONIAN CORDILLERA AND ITS MAIN RIVERS, BETWEEN 41° AND 48° SOUTH LATITUDE.*

By Dr. HANS STEFFEN.

EVERY passenger on board of one of the Pacific liners bound for the western coast of South America has the opportunity of surveying at close range, while sailing through the western reaches of Magellan's straits, a lofty panorama of rugged mountains partly covered with dense forests, and partly with snow and ice. Some of these steamers pursue their northerly route by a labyrinth of channels and passes formed by the precipitous sides of the mountains, while those of a larger draft prefer to avoid the dangers of rocks and narrow passes, and take the outward course, in which case the traveller catches only now and then chance glimpses of the distant snow-capped ridges and culminating peaks, as the visible outline of the enormous mass of mountains known under the comprehensive term of "Cordillera de los Andes."

The whole length of the western coast-line of Patagonia, in an extent of nearly 13° of the meridian, is formed by the flanks of these mountains, and in every place where we get near it, we receive the same

* Read at the Royal Geographical Society, March 19, 1900. Map, p. 140. It is hoped to publish a more detailed map in a future number.

general impression of a wild mountainous country, difficult of access, and quite worthless for any human purpose. It is, however, prudent not to draw from such a hasty impression a premature judgment. My present object is to promote a better acquaintance with the Patagonian Cordillera, with which I have become familiar in the course of several successive journeys, having crossed its whole breadth in various latitudes, from the Pacific shores up to the elevated plateaus usually known as the Patagonian "Pampas."

In order to penetrate to the interior of the Cordillera we shall come up by the main rivers flowing to the Pacific, the valleys of which are the paths laid down by nature; we shall then climb to some dominating summits to get the best possible comprehension of the orographical conformation of the Andine system; we shall pursue our course up to the headwaters of the main rivers, and in so doing we will sometimes find our way to the very borders of the Patagonian uplands, where the Cordillera is broken and lowered into hilly undulations of inferior relative height. This course will give us occasion to learn the practical value of the slopes and valleys of the Cordillera, and to consider the conditions under which roads might be opened and settlements be developed. It will then be seen that the first and unfavourable opinion is premature, and ought to be modified; that the Patagonian Cordillera, now abandoned and in a certain respect underestimated, is not without its riches, and that there are in that region vast fields not utilized as yet, that the activity of man might easily render accessible to colonization and improvement.

As a preliminary, it may be, however, interesting to give a historical outline showing how the geographical knowledge of the Patagonian Andine region has been evolved, up to the time when the actual Chilean-Argentine boundary question originated a systematic exploration and survey of that Cordilleran region on both sides at once.

The early Spanish conquerors, who took lasting possession of Chile, displayed great interest in sending exploring expeditions towards the south, as a means to obtain accurate knowledge of the extensive mountain region, of which Magellan had the first glimpse at a distance when sailing along its shores out of the Straits down to the latitude of the Gulf of Penas. The expeditions referred to began in the middle of the sixteenth century. Captain Francisco de Ulloa, entrusted with the command of the first one, in 1553, by Don Pedro de Valdivia, and four years later Captains Juan Fernandez Ladrillero and Francisco Cortés Hojea, sent by Don García Hurtado de Mendoza, surveyed carefully, in the face of all kinds of mishaps, the shores of the great island of Chiloe, the Chonos archipelago, as well as the channels, inlets, and islands extending southwards, up to the entrance of Magellan's straits. A complete or accurate knowledge of the topography of the country could not be, of

course, expected from such explorations, but abundant and valuable information as to its general geography, hydrography, resources, and native population was obtained. The journal of the voyage of Cortés Hojea is as important in this respect as the famous Ercilla's epic poem, "*La Araucana*," wherein are described with profuse and accurate information the natural conditions of the island of Chiloe, as well as the customs of its inhabitants.

Geography is indebted to the famous British sailor, Sir Francis Drake, for having found out in the course of his circumnavigation (1578) the true bearing of the west coast of the triangular southern end of the American Continent. This extensive length of coast was, however, hitherto unknown in its details, and it is due to Don Pedro Sarmiento de Gamboa, whose expedition was the first to cross Magellan's straits from west to east, to have collected careful information about some parts of it, as the Gulf of Trinidad and the Madre de Dios archipelago, in 1579.

Chiloe island was from the beginning of the seventeenth century the starting-point for the parties engaged in gaining geographical knowledge about the Patagonian region. In 1609 several Jesuit Fathers settled at Castro, a village situated in a sheltered harbour of the eastern coast of Chiloe, and there they soon raised their house to the rank of a college. From the beginning the Jesuits were indefatigable in the propagation of the gospel amongst the natives of the great island, and soon extended their excursions to the Guaitecas and Chonos archipelagoes, wherein they found a sparse population of poor, submissive, and peaceful people, who did not offer any opposition to the itinerant missionaries.

Meanwhile, a rumour was current for nearly half a century, among the credulous and superstitious people of all the southern Spanish colonies, as to the existence of a country of wonderful riches, a "*Dorado*" phantastically assumed to be placed in the southern Andine region, this account being adorned by the most extravagant stories. This tradition went under the name of "*La gran noticia de los Césares*," in honour of the supposed discoverer of the place, a Captain César, a follower of the famous British navigator Sebastian Cabot. Towards 1600 a city of the Césars was more particularly mentioned, sometimes believed to flourish on the shores of one of the great Patagonian lakes, and others in a harbour of the North sea or Atlantic ocean. Its inhabitants were believed to be descendants of Spaniards, either the survivors from the wrecked expedition of Don Alonso de Camargo, or of the unhappy settlers abandoned at the colonies "*Nombre de Jesus*" and "*Rey Don Felipe*," founded by Don Pedro Sarmiento de Gamboa in Magellan's straits.

The tradition based on an ancient chronicle was to the effect that those settlers stranded to the north of the straits, marched along the

Cordillera as far as the latitudes of the country of the Huiliches and Cuncos, that is to say near the Lake Nahuelhuapi, by the 41° parallel. Inspired by a belief in those traditions, military adventurers at first, and afterwards zealous missionaries, went in search of that region and of their lost countrymen, with the hope of finding the "enchanted city of the Cæsars." At the time of the Spanish conquest the lake of Nahuelhuapi and the surrounding Cordilleran country were already well known to the inhabitants of the earliest towns founded in the southern extremity of the great longitudinal valley of Chile. In fact, in the before-mentioned chronicle* it is related that "the cities and convents of



OSORNO VOLCANO, FROM A LAVA-FIELD NEAR THE WESTERN EXTREMITY OF LAKE TODOS LOS SANTOS.

Villarica and Osorno extended their dependencies and spiritual conquests over the eastern valleys of the Andes down to the famous Lake Nahuelhuapi." Just as in other parts of America, the European conquerors introduced several kinds of food-plants, especially fruit trees of the Old World; and it is therefore evident that the wild apple trees that are found to-day in patches at the foot of the eastern slopes of the Cordillera, between the latitudes of Villarica and Nahuelhuapi, are the living witnesses of the activity of those early settlers, who at that remote period brought with them the first germs of civilization to the southern

* The detailed early history of the Nahuelhuapi region may be seen in the introductory chapters of Dr. F. Fonck's recent book, 'Viajes de Fray Francisco Menendez a Nahuelhuapi.' Valparaiso, 1900.

valleys of the Cordillera, and even to the desert and "pampas" stretched at its eastern side.

In the year 1621 the army captain Diego Flores de Leon effected his famous journey, starting from Calbuco, crossing the Cordillera by the valley of the river Peulla, through the pass actually called Boquete de Perez Rosales, and coming down to Nahuelhuapi, where he collected information about the then numerous native population of the interior of Patagonia. One year before, the Spanish navy pilot, Juan Garcia Tao, had sailed from Chiloe in a southerly direction, navigating through the Chonos and Guaitecas archipelagoes till he found his way stopped by the isthmus of Ofqui, a very narrow strip of lowland connecting the Taitao peninsula with the mainland. A long series of voyages carried out in the same direction was thus inaugurated, some of the explorers contriving to go further south, animated by the desire to find the way to the mysterious city of the Cæsars amidst the network of channels and sea-arms cut out from the Patagonian coast, from the gulf of Reloncavi southwards.

Although most of these expeditions did not yield any positive result in advance of the topography and geography of the regions visited, there were some explorers whose charts, journals, and other information are even to-day valuable, and may be consulted with profit. The perusal of their narratives makes us wonder at the intrepidity of those early pioneers, who, with the most primitive means of transportation, defied all the dangers of a stormy sea, as well as those offered by a desert, mountainous, and inhospitable country. It is truly wonderful that, as early as 1672, the Jesuit Father Mascardi, Rector of the Castro College, could carry out a journey from the mission of Nahuelhuapi across the barren Patagonian plains, escorted by native "Caciques," and arrive at a harbour on the Atlantic coast, probably the port of San Julian, as they found there unequivocal traces of the stay of British navigators, being very likely those of Sir John Narborough's expedition, which two years before had been anchored in that harbour. Compared with the extent of Father Mascardi's long journey, the distance between the Nahuelhuapi settlement and the main mission at Chiloe sinks into insignificance, and we have positive information as to the traffic between both places being frequent and relatively easy.

Besides the route already mentioned—through the Peulla valley and across the Perez Rosales pass—there was another way without the drawback of lake-crossing, by which Nahuelhuapi might be reached in three days with mules and horses from the Pacific coast. This road, styled "Camino de Vuriloche," fell into oblivion after the raiding of the Nahuelhuapi mission by the Puelche Indians in 1717, and has only been found out again, as it is thought, in recent years.

It was not, however, only the wish of discovering the chimerical enchanted city which impelled the Spanish Colonial Government to

encourage, and the missionaries or private adventurers to effect, those journeys between the settled part of Chile and Patagonia, but also political motives. After the expedition of the Dutch corsair, Henry Brouwer, who, in 1643, raided the island of Chiloe, it was rumoured that a foreign power, either Dutch or British, had taken possession of several points of the coast south of Chiloe, and this induced the Spanish authorities to send expeditions for reconnoitring, and to make effective the power of the Spanish Crown over those remote dominions.

A voyage worth being recalled is that of the Spanish navy captain, Antonio de Vea, in 1675-76, who sailed through the Chiloe, Guaitecas, and Chonos archipelagoes, crossed the Ofqui isthmus, and sailed again across the gulf of Penas, up to the Guayanecos islands and the Fallos channel towards the 48th parallel. Although there is a want of accuracy in the latitudes recorded in that navigator's journal, there is still in it most valuable information about the physical geography of the archipelagoes and continental shores.

It is worthy of notice that all the voyages just mentioned, during the sixteenth and seventeenth centuries, began on the Pacific side, while two or three attempts to cross over eastern Patagonia to the Cordillera, and down to the Pacific shores from the Atlantic, failed, as the expeditions of Don Hernando Arias de Saavedra in 1605, and Don Geronimo Luis de Cabrera in 1622. Both explorers retreated from the Rio Negro line, yielding to the aggression of the natives.

We must now pass over an interval of a whole century in order to meet with explorations constituting a true step in advance in the clearing up of the geographical horizon of Patagonia.

One of the most interesting episodes, however, in the history of travel along the southern shores of America happened during this interval. We allude to the wreck of the British man-of-war *Wager*, belonging to Commodore Anson's expedition, and the escape of some of the crew, amongst them that of the famous admiral, Sir John Byron, then a midshipman of the navy, who, under the guidance of the natives then inhabiting those shores, effected a journey from Guayanecos to Chiloe. The narrative of this expedition, written in 1768 by Byron, a quarter of a century later, pictures wonderfully the general character of the country of the gulf of Penas, with its broken shore-line and deep fjords; although the especial conditions of the journey, in which the most tremendous hardships had to be endured, did not allow the author to attempt even a rudimentary sketch of the course followed; it is thus sometimes rather difficult to reconcile his topographical information with the actual charts of the region.

In 1767, the very year in which the expulsion of the Jesuit community from Chile took place, ended also the memorable and successful voyages effected by Father José Garcia, one of the most indefatigable of their missionaries, whose journal of voyages is replete with

interesting geographical information respecting the Patagonian lands and islands visited by him. He drew a chart of the coast-line between the 43rd and 49th parallels, wherein are shown with fair accuracy the principal inlets of the sea into the mainland, as well as the corresponding large rivers, the Palena and the Aisen, the gulf of Penas' inlets and channels, including the largest of all, Baker channel, also called to-day Calen inlet, but to which he applied the name of Estero Messier, that belongs now to a neighbouring channel.

The Spanish Colonial government were in the meanwhile mindful of the possibility of a foreign investment of their southern dominions, and to better prevent such an emergency they put, in 1768, their southern headquarters of Chiloe under the direct control of the Viceroy of Peru, who also held under his control henceforward the religious missions settled on that island.

At that time there was an advance as to the topographical knowledge of the country, mostly due to the efforts of the pilot Don Francisco Hipolito Machado, who in 1768 surveyed the coast-line between Chiloe and the Gulf of Penas' southern extremity. Besides the truly scientific descriptions contained in his reports, he determined, with fair accuracy, latitudes, bearings, and the magnetic variation of the compass; geography is also indebted to him for important sketches of the Chonos Archipelago, Taitao Peninsula, Gulf of Penas, and Fallos Channel.

It was only ten years later, after the Plata State was raised to a Viceroyalty, that attempts to settle and colonize Patagonia from the Atlantic side became more frequent and successful. The small village and fort, "El Carmen de Rio Negro," now called "Patagones," founded by the first Viceroy of Buenos Aires on the lower Rio Negro, played here the same part, as point of departure of the expeditions, as the city of Castro, two hundred and thirteen years its senior, in Chiloe, at a still higher latitude. Just then a book had been published, entitled 'Description of Patagonia,' by the Jesuit Father Tomas Falkner, as a result of his own travels and researches, made during many years amongst the natives, with whose language he had become familiar. This book, that was utilized for the drawing up of the great official map of South America engraved and published at Madrid in 1775 by Don Juan de la Cruz Cano y Olmedilla, had called the attention of the Spanish Crown to the weakness of the defence of its southern dominions in America, showing the facilities afforded to a foreign invasion by the waterway of the river Negro; this river proceeding, according to an erroneous belief of Father Falkner, from a lake distant only a two days' journey from Valdivia on the Pacific shore. As a result of the fears thus raised, small settlements were founded along the Patagonian Atlantic shore up to the Santa Cruz river, and an expedition was sent, commanded by the Royal Navy pilot, Don Basilio Villarino, instructed to explore the Rio Negro to its origin in

the Cordillera. Villarino carried out successfully his enterprise in the years 1782 and 1783, going up to the Rio Negro, then the Limay, and its northern tributary, the Collon-Cura, to its headwaters in the "manzanales" (apple-fields) country, where he sighted the snow-capped Lanin volcano, and gathered from the natives information about the surrounding country, and even about the Spanish mission at Nahuelhuapi. But, although the navigability of the Rio Negro up to the Cordilleran slopes was thus proved, it was at the same time brought to the knowledge of the Spanish Government that such a route did not afford the facilities that had been supposed for a foreign investment on a large scale, and, consequently, they desisted from further systematical explorations in Patagonia from the Atlantic side, and even caused most of the newly-founded coast settlements to be broken up.



VALLEY OF RIVER ALANZO NEAR ITS JUNCTION WITH PUELO VALLEY (LOOKING SOUTH).

This decision was maintained when the results of another expedition were known. We refer to the journey effected by the explorer, Don Antonio Viedma, who carried it out at the time just referred to. Starting from San Julian, he crossed the country inhabited by the Tehuelches at the north of the Santa Cruz river, and reached the eastern slopes of the Cordillera, where he discovered the lake that bears even now the name of that intrepid traveller. While the geographical exploration of the eastern part of Patagonia was thus interrupted, it was continued on the Pacific side, to carry out a minute topographical survey of the long extent of coast-line and islands, including the mountainous adjacent land, between 41° and 46°. This work was due to a lieutenant of the Royal Spanish Navy, Don José de Moraleda y Montero. His great spherical chart of that region, his numerous partial maps, journals of travel and navigation, must be considered as of the highest

merit when we bear in mind that Moraleda had to carry out his work (between the years 1787 and 1796) by means of rough Indian canoes (piraguas), fitted out to carry sail like a schooner. It is to be regretted, however, that such a worthy hydrographer did not acquire a correct idea as to the inland Cordillera and the valleys proceeding therefrom. As he did not seriously attempt to penetrate into that mountainous region along the shores of which he was continually sailing, he conceived a prejudiced opinion which, if accurate with respect to lengthy stretches of the sea-shore, was utterly unfounded as to the great hinterland valleys of the Cordillera. Moraleda states that no inlet of the coast is of any use as a harbour for vessels or small craft, as their bottoms are insecure for the purpose of anchorage; that there is no cultivable or productive soil in any agricultural sense; that the valleys cannot be made use of for crossing to the other side of the Cordillera; and that the rivers are not practicable as waterways, with the exception of three of them, where small boats may only enter as far as the tide. We shall have occasion, in the course of the present paper, to rectify this general opinion of the Spanish pilot, which has doubtless contributed to the Patagonian Cordillera being considered, until very recently, as a worthless country.

At the same time that Moraleda surveyed the shores of the Andine region, its recesses were reached by another indefatigable traveller, whose incursions are the last revival of those of the seventeenth century effected in search of the enchanted city of "the Cæsars;" we refer to the Franciscan Father, Francisco Menendez. After two voyages to the Ofqui isthmus and to the Gulf of Penas, and another two to Comau inlet and the river Vodudahue, where he crossed almost the whole breadth of the Cordillera in the latitude of $42^{\circ} 30'$, he went in four successive expeditions in the direction of Nahuelhuapi, the last of which occurred in 1794. Unfortunately, Father Menendez was not possessed of sufficient scientific knowledge to be able to draw a map of the mountainous region over which he travelled. It is therefore difficult to give a graphic shape to his not very clear and precise topographical information.

Although the apparent and official mission of Father Menendez was the investigation of "the Cæsars," he paid little attention to that fancy, and his expeditions were undoubtedly stimulated by the desire to explore new lands, to re-discover the lost path of Vuriloche, and to have friendly intercourse with the Indians of Nahuelhuapi, so as to be able to re-settle a mission at that place. We find in the journals of his expeditions the first information about the great glaciers of Mount Tronador, and that of a general kind on the orography and hydrography of one of the most intricate regions of the Cordillera.

During the first decades of the present century, as the South American colonies were absorbed in the great struggle for independence against Spain, no progress was made in Patagonian geography on

the part of the nations directly interested in it. The famous British exploring expeditions carried out in the years 1826 to 1836 by Parker King and Fitzroy with the *Adventure* and *Beagle*, opened in South America the modern era of scientific surveys, and laid the solid basis on which, even at present, rest all the minor works done on both sides of that continent.

The value of the hydrographic work carried out by those officers and their able staff is too well known for us to do anything more than mention their splendid general charts and the detailed maps of harbours and dangerous passes and narrows that had been issued subsequently. At the same time, Darwin's observations outlined in their fundamental features the physiography and geology of the southern part of the American continent. We must not forget, however, that, owing to the hydrographical character of the surveys, these were not extended farther than the foot of the Cordillera, and were never pushed inland from one side to the other. Only such prominent peaks as could be sighted from the shore or by the landing party, were put down on the maps, and no attempt was made to draw any connection between the different ranges of the mountains, no knowledge being gained, indeed, on that score. In fact, the large Andine rivers flowing to the Pacific remained unexplored, and the existence of spacious and fertile valleys in the subandine region at the headwaters of those rivers was as unsuspected as before.

As at the time when the country was under the Spanish rule, the Andine region of the lakes of Todos los Santos and Nahuelhuapi was the first to be visited and surveyed by scientific travellers. In 1852 Dr. Philippi, a noted German naturalist, made an ascent of the Osorno volcano; in 1856, Dr. Fonck, following the old path of the Jesuit missionaries and Father Menendez, crossed over to the shores of Nahuelhuapi; and in 1863, Don Guillermo E. Cox sailed on this lake and through its outlet, by the river Limay, down to its confluence with its tributary the river Traful, where his boat was wrecked, and the interposition of the natives put an end to his daring enterprise. The topographical knowledge of this region of the Andes contributed by those explorers is fairly accurate, and was completed later on by the surveys carried out in 1881 by some Argentine naval officers under the command of Lieutenant O'Connor.

With regard to the vast region called Eastern Patagonia, its general aspects and main topographical features were rendered popular by the interesting narratives of Captain Musters, who, in 1869 and 1870, travelled over from the Santa Cruz river to the Nahuelhuapi and Manzanales country, in company with a tribe of Tehuelche Indians, of whose customs he gave a most correct account. During the following decades the Argentine expeditions, led by Don Francisco P. Moreno, Major Moyano, and Don Ramón Lista, contributed new and useful information about the topography and natural history of Patagonia,

with the exception of the interior and western ranges of the Cordillera, where they did not penetrate; the survey of the great lacustrine basin constituting the headwaters of the river Santa Cruz, carried out by Major Moyano, is one of the most important results of the expeditions just mentioned, and, at the time, a most valuable addition to South American cartography.

Here, as in Northern Patagonia, where the Chilean and Argentine surveyors of Nahuelhuapi covered the same ground, it happened that in 1877 a Chilean party, under the command of the navy Lieut. Rogers, extended its surveys from the shores of the inlets of the Pacific to those of Lake Santa Cruz.

Some thirty years ago the Chilean Government undertook a detailed exploration and survey of the extensive Western Patagonian littoral, and entrusted this work to several naval officers, amongst whom Don Francisco Vidal Gormaz, Don Enrique Simpson, Don Ramón Serrano, and, recently, Don Roberto Maldonado must be especially mentioned. This is not the place to give a detailed account of the works carried out by these hydrographers and surveyors; their results have been published, with a great number of maps, in the Chilean Hydrographic Office Annual, and have been duly incorporated in the official charts issued by the British Admiralty.

Together with the foregoing we must mention the explorations and surveys carried out by the officers of the British frigates *Nassau* (1866-69) and *Alert* (1879-80), by the German corvette *Albatros* (1883-84), and others of minor importance. The whole of these combined constitute a nearly complete general map of the extensive, much-broken, and intricate Patagonian shore-line and adjacent archipelagoes; though many details and recesses of secondary channels and inlets want to be completed. It must be observed that the operations and surveys carried out by the Chilean navy were not restricted to the coast, but were sometimes pushed inland amidst the Cordillera, some of these latter explorations being worthy of notice.

Captain Vidal Gormaz was the first to publish geographical information on the lower courses of rivers Petrohue, Cochamó, Puelo, and Vodudahue; Captain Simpson explored part of the rivers Aisen and Huemules; and Captain Serrano Montaner penetrated into the Reñihué, Corcovado, and Palena valleys.

Captain Simpson's account of his expedition to the Aisen has been, indeed, through a too literal interpretation of its terms, the cause of a statement being represented as the opinion of the Chilean geographers, to the effect that the sources of this river were to be found far away to the east of the last slopes of the Cordillera, amidst the Patagonian Pampas. As a matter of fact, Captain Simpson's words are *—"It

* 'Anuario Hidrográfico de la Marina de Chile,' vol. i. p. 146.

seems that the level of the low lands rises from the Pacific up to a range of secondary importance, farther inland than the high belt (collar) of mountains hitherto called Cordillera of the Andes, but of which it is only the southern extension. The true water-parting is really effected by that secondary range (sierra) or ridge (lomo); this being the reason why some rivers, as the Aisen, proceeding from the other side, completely cut across the belt (collar) of the Andes." The actual truth is that some branches of the Aisen rise on the undulating plains into which the eastern slopes of the Andes merge; but Captain Simpson's authority should not be quoted even to prove this fact, as he did not reach or see that piece of the country, nor penetrate so far inland as he was led to believe. The enormous difficulties opposing an advance up-stream with boats in the Patagonian rivers,



NARROWS OF RIVER ALANSO (LOOKING NORTH).

the eminently variable current of which renders the reckoning of the distances so liable to mistake, as well as the unfavourable conditions for any check on the bearings or situation of the explorer amidst dark virgin forests and under an almost constantly clouded sky, that does not allow of sighting prominent peaks for identification, are circumstances much impairing the value of the maps based on such early surveys for measurement of distances. In the carrying out of more careful surveys I have had, as well as other fellow-explorers, occasion to realize that Simpson's and Serrano's distances were greatly exaggerated; Mr. Oscar de Fischer especially, who surveyed by the stadia, as a member of my expedition to the Aisen, the branch of this river visited by Simpson, found traces that he could easily identify of the last encampment of this explorer, lying a whole degree in longitude to the west of the position where it was marked on the map, and, in fact, in

the middle of the Cordillera. It may be seen, besides, in Simpson's narrative, that the information given by him as to the origin of the river was gathered from some of his boatmen or carriers (peones) sent two days in advance, and who were not much to be relied upon, interested as they were in the turning back of the expedition to the comforts of their ship.

Captain Serrano's expedition to the Palena in 1886-87 is also especially interesting. It was then ascertained that this large river is a main waterway which finds its course to the shore between powerful masses of the Cordillera from a comparatively open country, where the ground is not so rugged and the forests not so dense, the traffic of horses being consequently possible. After journeying up-stream for four weeks, Captain Serrano met at last some mounted Pehuenche Indians, and after gathering from them some information on the headwaters country, returned to the Pacific coast. Some time after, an Argentine explorer, Colonel Jorge Fontana, advanced from the Atlantic side to the point reached by Serrano, about 75 miles from the Pacific, where the Pehuenche Indians gave him the news of the Chilean expedition. This was the first time that explorers proceeding from different sides had reached the same ground in our section of the Cordillera to the south of Nahuelhuapi. Colonel Fontana had already extended his excursions over the subandine region, nearing the 43rd parallel, to the north of the Palena headwaters. He had reached a large and beautiful valley of the Cordillera, that he called "16th of October," and discovered a river named by the Indians Staleufu (Futaleufu), erroneously assumed to be the upper course of the river called Corcovado on the Chilean charts.

Colonel Fontana's expedition is also associated with the first Argentine settlement in a valley of the Patagonian Cordillera where till then only nomadic Indians had penetrated when hunting for wild cattle. By the Argentine Government's authority, a colony was founded, peopled mainly by Welsh settlers coming from Rawson, at the mouth of the river Chubut; subsequently some surrounding valleys have also been partly occupied by Argentine settlers. Chile, on her side, founded in 1889 a settlement at Leones island, at the mouth of the Palena river, and claimed against the exercise of Argentine authority on 16th of October valley, as being on her side of the watershed of the Cordillera, which line, according to the actual boundary agreement, she maintained, ought to be the frontier.

We have thus come in touch with the actual boundary question, that, apart from all political aspects, has undoubtedly been advantageous in a geographical sense for both countries involved, as an incentive for exploring and surveying vast regions of Patagonia hitherto untrodden and unknown. To realize the great progress recently made on that score, it is sufficient to compare the corresponding section of Prof. Brackebusch's map of Argentina, published in 1891, as representing the

consensus of geographical knowledge of that time, with the new general maps that contain the results of the exploring expeditions carried out by order of the Chilean Government as well as by direction of the Argentine La Plata Museum, and the basis of which are the accurate surveys of the boundary commissions of both countries. The work of those commissions embrace also much interesting information on physical geography, and has provided positive information as to the extent of useful country for settlement in that part of the American continent.

When I arrived at Santiago de Chile in 1889, under a Government contract as professor of geography and history at the State Pedagogical Institute, I soon came to understand that the broadest field for the geographical studies that I had in mind was to be found in the Andine region of Patagonia, as, besides presenting many interesting physiological phenomena, it was called to play a preponderant part in the Chilean-Argentine boundary question. When peace and order prevailed again in Chile, after the revolution of 1891, the work of delimitation began at once, and I also carried out in the same summer season my first excursion in the south of the country, not so much intended as an original exploration to acquire a general idea of the ground, as to become familiar with the way of travelling in the region. The severity of the rainy weather, the exuberant growth of vegetation, and the extreme scarcity of resources in the Cordillera, demand of the traveller a special preparation and a minute acquaintance with a great many details concerning the people, boats and other means of transportation, loading and packing of provisions, etc. We know of expeditions that, starting from the coast in high confidence and with much display, have come to grief after a few marches into the Cordillera, simply because their leaders had disdained to inquire into the routine of those minor things on which, though they may appear insignificant at first, the success of the expedition often depends. As I am fully aware of the importance of this point, I must begin with some observations relative to the way of travelling that the local conditions of country and weather impose on the Western Patagonia explorer.

It will be readily understood that, in order to penetrate inland among such extensive mountains covered with dense forests, the best paths are those laid down by nature, that is, the valleys of the largest rivers proceeding therefrom. Thus, the first part of the journey will usually be effected by navigating up-stream in a water-course, for which purpose the expedition must be fitted with boats, collapsable, or otherwise specially adapted for the object. The rivers of Western Patagonia do not form any considerable deltas, but their mouths are barred by sand-banks, which must be located and surveyed previously, to find the main channel of the entrance. In the lower part of their course, where

the rivers meander between shallow alluvial banks carved out of the bottom of a valley several miles wide, there are no obstacles to the navigation, and there is even sufficient depth of water for steam-launches. We have had the experience of this in the rivers Puelo and Palena going up the first rapids of the latter, and may affirm that the rivers Baker, Aisen, Cisnes, and Yelcho admit of the same means of transport.

Higher up-stream, out of reach of the tides, the same rivers offer serious obstacles to navigation. Large boulders, rocks, and trunks of trees gather in their channels, and the stream forms gravel-beds, sand-banks, and islands, between which the waters flow impetuously, and over long stretches keep boiling furiously, giving rise to a high and irregular swell. The water-currents work steadily and strongly to remove these impediments, which usually form a step in the declivity of the river-slopes, so that after the rapids and turmoils there is frequently a long piece of deep and smooth water. On these sections the navigation must be effected in low-keeled slight boats fitted with four or six oars, and manned by people of well-known ability and competence in this kind of work. This class of people is fortunately found at Chiloe, the adjacent islands, and in the small villages of Reloncavi inlet; my personal experience enables me to affirm that the latter especially show an uncommon courage and ability for river navigation. It frequently happens that every attempt to row against the stream is frustrated, and if the depth of the water is not sufficient for making use of the sails, there is no other means of going forward but to tug the boat with a rope from the shore, or pull from the boat after tying the rope to a tree or rock. To effect these operations it is necessary to have at hand one or two light boats that may be sent ahead with the best men to reconnoitre the way, and tie the ropes at the convenient places. It happens also frequently that it is necessary to cross a swift current of the stream with loaded boats; the starting-point and the strength of the current must then be ascertained to a nicety, so as to reach safely a smooth place or a counter-current on the other side. There is usually no danger in effecting those movements, but such is not the case when submerged stones or logs lie hidden, liable to be struck by the boat, and thus causing a wreck in the midst of a heavy surf. On the whole, much practice and minute precaution are required for going up the rapids of the large Patagonian rivers; the men must be able at any moment to jump down into the water, and the explorers themselves have to incur the risk of an unavoidable wetting and of passing through very awkward and annoying situations. There is no doubt that going up-stream in those rivers is easier and less dangerous than coming down, when all depends on the watchful eye and cool head of the pilot, who in the midst of a vertiginous descent must see at a glance the passage through which he ought to steer the boat.

As the party advances inland the difficulties of navigation naturally increase, till finally the point is reached where these are insuperable, whether because a waterfall interrupts the river-slopes, or because of the long and uninterrupted series of rapids where the work of tugging the boats may be irreconcilable with the purposes of the expedition. The boats must then be left aside for the time, care being taken to store them away not only from the action of the sun's rays, but also out of range of the floods that frequently raise the level of the river in a few months or even weeks 12 to 15 feet.

Then commences the march on foot across the forests of the river-bank; the seamen and rowers now have to play the part of carriers and woodmen. It is of the utmost importance at this moment to ascertain the direction in which the expedition must move, by ascending to some



RIVER CHUBUT IN ALAITEN VALLEY AND THE WATER-PARTING CORDILLERAN RANGES
(LOOKING WEST).

dominating summit or ridge, from which the path for several weeks to come, may in many cases be traced; many difficulties offered by the ground may in a certain way be foreseen, and many circuits or windings of the valley may thus be avoided. These ascents to high points ought to be repeated as frequently as the lapse of time available for the journey allows, as, besides the opportunities of checking his beatings, they also afford to the explorer the best occasion of acquiring a general idea about the orographical conformation of the Cordillera and other features of the region he is crossing.

The most serious impediments at this phase of the expedition are the forests covering more than three-fourths of the whole ground. The worst feature is the underbrush, chiefly composed of bamboo-canés (*Chusquea quila* and *Chusquea colihue*), fuchsia-bushes, chaúra, tepú, etc.,

which grow with incredible exuberance under the shade of the high trees; the latter being beech trees of different species, ciprés, laurel, mañiu, etc. That underbrush bars the way to the travellers, who have to open their path by means of axes and "machetes" (broad and curved blades). The order of the march must, therefore, be so arranged as to send ahead a party of "macheteros," whose number must depend on the thickness of the brushwood; while this party is engaged in the clearing of the path, the rest are carrying the loads, an operation requiring usually two or three journeys of each carrier. It will be realized that, under such conditions, the advance cannot be but slow; the average of a day's journey, or say, ten to twelve hours' work, does not exceed, in fact, 2 miles in a straight line over a dense forest, and provided the ground is not too broken. The impossibility for a caravan composed of mounted men and beasts of burden to force a way through the virgin forests of the Patagonian Cordillera, is a very great inconvenience; but until well-cleared paths are open, and while there is no other way to effect the frequent crossings of swift streams, than by difficult and dangerous manœuvres with boats, horses or any kind of cattle would be more of a hindrance than a help to the expeditions. It is lucky for such parties that the same shoremen of Chiloe and Reloncavi, whose fitness and ability to row, steer, and handle a boat in a river are undisputable, are at the same time skilful woodmen, trained from early life to cut down trees, to carry pieces of wood and other heavy loads over forest footpaths that often scarcely deserve the name of such. We might say that they have a natural training for every kind of work required in an exploring expedition; their sure-footedness with heavy loads up and down steep hills, as well as through swamps; their surmounting of obstacles, crossing ravines over fallen trees (*cui-cuyes*), is truly marvellous. Their foot-gear is a piece of raw hide tied to the foot, called "ojota;" beyond this, they are rather indifferent about their dress, and do not seek any particular protection against the unavoidable soaking that occurs every day. As to food, they give preference to the baked wheat flour (*harina tostada*), and to dried and salted beef (*charqui*), both kind of provisions being the most indispensable for campaigning in Chilean Patagonia.

As the journey by land is usually along or not far from the course of a large river, or by a valley where lakes occur at intervals, it is frequently convenient or even necessary to break the continuity of the march by stretches of navigation. When it is foreseen that such will be the case, as time or material to build a raft may be scarce, it is advisable to have the expedition supplied with small transportable boats, collapsable or composed of pieces that may be put together when they are to be made use of. I may recommend for this purpose transportable boats composed of two pieces, which with the oars and fittings are carried in three loads. I know by more than one experience that the

trouble incurred in carrying those boats through rough forest footpaths is fully compensated later on, when the traveller is enabled to overcome all kinds of obstacles offered by rivers and lakes in the way of the party.

When the expedition has advanced in the way just explained, as far as the region of the large subandine valleys, which lie amongst the eastern half of the Cordilleran masses, the conformation of the ground and the character of the vegetation become at once such as to allow of a more rapid march. If it is desired, then, to reach by the "Pampa" some inhabited place of Argentine Patagonia, saddle and pack horses would be indispensable; it would be found advantageous, in such a case, to get rid of the main body of carriers, sending them back with the boats to the starting-point on the sea-shore, and retaining only such assistants as are necessary for carrying the remaining loads up to the point where the horses are expected to be found. The Chilotes (the inhabitants of Chiloe island), however useful they may be for the journey with boats and on foot, are not so fit, some few excepted, to play the part of "arrieros" (drivers) or of mounted attendants for a long journey on horseback. It has been found preferable, for this reason, to get new attendants more conversant with the use of horses, as the Chilean or Argentine cowboys (*huasos* or *gauchos*). The extension of the journey over the Argentine Patagonian land requires, besides, many other special arrangements, so that it seems desirable in such cases to combine the exploring party with an auxiliary one, whose part it would be to bring to a place agreed on the necessary men and supplies.

Notwithstanding the most careful and adequate preparations, the success of an exploring expedition through the Patagonian Cordillera may be endangered by the condition of the weather, even in midsummer. Every explorer ought to be fully prepared to eventually lose one or two months as a consequence of rains or floods, so that the supplies and attendants must be calculated accordingly. From Valdivia to the Straits of Magellan, the climate of the Pacific coast is extremely rainy, the maximum fall taking place very probably about the 44th parallel. Two or three weeks' continuous rainfall are not by any means uncommon, even in spring and summer, from October to April; this rainfall extends also to the mainland, though it decreases from west to east. During my expedition to the river Cisnes (44° to 45°), for instance, we had in January and February, 1898, as many as fifty days of torrential rain, such as made it impossible to leave the camp for any surveying purpose. Then, towards the second half of March heavy snowfall began, so that it was only at the end of April, after a four months' journey, that the expedition reached the first settlement in the Argentine Patagonia. It is barely necessary to hint at the effects that such a long season of rain has on the ground; the volume and flow

of the streams are increased in an appalling manner, thousands of giant trees being carried away; every hollow and depression of the valleys is turned into unfordable mud-pools, and on the slopes of the hills landslips occur, large pieces of ground with trees and rocks being hurled down.

It must not be presumed that because the excessive moisture of the weather is the main drawback to Patagonian exploration, there is any want of inconvenience arising from opposite causes—that is, from lengthy periods of drought occurring with some frequency at the summer time. When there is no rain for three or four weeks running, the woods become extraordinarily dry, and the utmost care is required to avoid a fire that might spread to an enormous extent, and even endanger the success of the expedition itself. The “Chilotes,” like the Pampa Indians, suffer from what might be called a mania for setting fire to every combustible material which they come across; they require, therefore, to be rigorously watched, especially when crossing the extensive grass plains of the subandine valleys. During my last expedition to Lake Cochrane, we were chased for three weeks by an enormous fire which had sprung up at our backs through the carelessness of our people, and, helped by an unceasing westerly wind, consumed all the grass of the hills and ravines of the southern shore of that lake. Besides the dangers arising from this source, that may threaten the camps and deposits of supplies for the expedition, there is the additional nuisance of the smoke constantly obscuring the whole horizon, and so preventing the carrying out of any surveying operation.

I hope to have succeeded in giving a fair idea of the particulars of travelling in Cordilleran Patagonia, as well as of the many difficulties attending such journeys. I may proceed now to a description, keeping to their broad features, of the orographical and hydrographical main systems forming the relief of Andine Patagonia between the 41st and 48th parallels. Besides the results of my own explorations, I have been able to make use of the information gathered by other fellow-explorers on the Chilean side, whose expeditions have also taken place in the last decade.

Proceeding from north to south, we have to deal first with a region of the Andes famous in the history of travel, which is drained partly to the west towards Reloncavi inlet or Boca, and partly to the east towards the basins of rivers Negro and Chubut. Three independent watercourses flow into the Boca de Reloncavi, the northernmost fjord of the Patagonian littoral, viz. the river Petrohue, which is the drainage channel of Lake Todos los Santos; the river Cochamo; and the largest of all, the river Puelo, which, together with its tributary, river Manso, collects the waters of an extensive region of Andine lakes.

The river Petrohue flows from Lake Todos los Santos in a south-

westerly direction on the bottom of a deep depression interposed between the granite scarps of the Santo Domingo Cordillera and the lava fields of the Osorno volcano, the slopes of which descend gently to the east and to the south. An uninterrupted series of rapids render the navigation of the river impossible for any kind of boats. The accumulation of volcanic materials proceeding from the Osorno and Calbuco volcanoes has probably obstructed the former channel of the river towards the Lake of Llanquihue, and constrained it to force a new course towards the Reloncavi inlet. The valley between the slopes of Santo Domingo Cordillera on the east, and the precipices of Cerro Tellez and Cerros Rolizos to the west, is a succession of alternate widenings and defiles resulting from the approximation of the basaltic cliffs on both sides, showing a prismatic columnar formation uncommonly regular and beautiful. The left bank of Rio Petrohue is inaccessible for nearly its whole extent; on the right there are good pasture-lands belonging to the Llanquihue settlers, which have suffered considerably from the fall of ashes and mud-streams discharged by the Calbuco volcano during its eruption of 1893.



RIVER CISNES, 10 MILES FROM ITS MOUTH.

Lake Todos los Santos, formerly called Esmeralda, because of its blue-green colour, is an Andine lake in its whole extent, its shores being formed, save a few sections of low beach, by inaccessible cliffs plunging straight into the waters. Its southern and eastern extremities correspond to two important depressions of the Cordillera; the former extends as far as the Reloncavi inlet through the basin of the small Lake Cayutue; and the latter, formed by the valley of river Peulla, reaches the foot of the Perez Rozales Pass, a main water-parting point, where a mule-track is in use for traffic between Todos los Santos and Nahuelhuapi. As in the time of the Jesuit missionaries, the first of those lakes plays to-day

an important part in the journey from Chile, especially since some enterprising traders of Puerto Montt have launched there a small steamer plying from one end of the lake to the other in two or three hours.

Going up the valley of river Peulla, which is the main tributary to the lake, we arrive at the Boquete Perez Rosales, where, at about 3100 feet above sea-level, runs the continental divide line, winding between lakelets and marshy fields which fill the bottom of the undulations of a small plateau. The pass is formed by a remarkable gap in a ridge which extends to the north-west over high hills until it merges, under the 41st parallel, into another well-defined range lying in a south-westerly direction, and to which belong some notable volcanic peaks, as the Puntagudo, La Picada and the Osorno volcano, which form the northern boundary of Todos los Santos basin. Towards the east several ranges are detached from the dividing ridge; a south-easterly direction prevailing amongst them, and such ranges respectively coming to an end on the borders of the western and north-western arms of Lake Nahuelhuapi. Nearly all these mountain chains are partly covered with perpetual snow; but on the Argentine side the growth of vegetation is not so luxuriant as on the side of Chile, so that between the primeval forests of the lower slopes and the snow-line, a large band of bare rocks is interposed, its red-grey colour recalling to the traveller the appearance of the Cordillera in central and northern Chile.

If we follow the dividing range further south, we soon approach the lofty mass of Mount Tronador, rising on a wide base of crystallized schists, and displaying in its upper slopes the extensive fields of compacted snow (firn), which give birth to half a dozen glaciers sloping down to the north, east, and south, and from which respectively spring the rivers Peulla, Frio, and Blanco. The stately structure is crowned by three outstanding summits that, judging by some specimens collected by us, are composed of andesitic rock, their culminating point rising to 11,345 feet above the sea, according to trigonometrical measurements made by the Chilean Boundary Commission. It is worthy of notice that the continental water-parting does not take place over this highest summit, but on a secondary and easterly one, which separates the glaciers that give rise to the river Peulla on the one side and to the river Frio, flowing to Lake Nahuelhuapi, on the other. Eastwards the dividing range is parallel with the longitudinal depression or "cajón" of the river Frio, and with another andesitic range which is cut short at its northern extremity by an arm of Lake Nahuelhuapi, that being connected at its southern end with the mass of the Tronador by a transverse link, the ridge of which is flattened at the Barros Arana Pass (4636 feet), and constitutes the oceanic water-parting in its remarkable easterly deviation.

The oro-hydrographic conformation of the Andine region extending southwards of Mount Tronador is extremely complex, and the researches and explorations of some years to come will be needed to obtain an accurate knowledge of all its details. I am, however, able to indicate the prominent features of the oro-hydrographic structure of the said region, availing myself of the results of the surveys carried out in 1897-98 by the Chilean Boundary Commission, of two reconnoitering expeditions of my fellow-traveller Mr. Oscar de Fischer in 1893 and 1899, and of my own explorations in the Llanquihue Cordillera in 1893, and to the basin of river Manso in 1896.

We must say, in the first place, that, although this has been affirmed, we do not know any high snow-capped mountain range extending southwards from Mount Tronador; a deep and wide depression lies, in fact, between the slopes of that giant mountain and the semicircular range which contains the headwaters basin of Rio Cochamo. The ridge of that range culminates in the curiously shaped hill "Cuerno del Diablo" (the Devil's Horn), of some 6500 feet, near the top of which volcanic tophus with alternate layers of lava and basaltic conglomerate have been found. Between Cuerno del Diablo and the Reloncavi shores there runs from east to west a mountain range bearing in parts extensive snow-fields, its ridge, however, being sufficiently low at the passes Valverde and Raulies as to allow the possibility of communication between Cochamo valley and those of the rivers Blanco and Concha.

Cochamo valley, though not proceeding from the main watershed range, offers, however, favourable conditions for a horse-track, which, after crossing some secondary ridges, should descend to Manso valley, where the way is clear to the open Patagonian pampa. This valley is also very rich in valuable timber, especially "alerce" (*Fitzroya patagonica*) and "mañiu" (*Podocarpus* and *Saxegothea*), as well as in extensive lands fit for agricultural purposes, the cattle finding abundant food in the vast quila and colihue growths. The valley we are speaking of is confined on its southern side by rugged masses of mountains of some 8000 feet high, with extensive snow-fields, the recesses of which are still untrodden by men. The western slopes of these mountains plunge into the Reloncavi waters, while they are surrounded on their southern and eastern sides by the Lower Puelo and Manso valleys. This same mountainous mass is also cut across towards the north-east by the deep gorge of the river Morros, where the track before mentioned could be made to pass. A col 3600 feet high allows the communication between Cochamo and Morros valleys, leading thereby to the main waterway of river Manso, which is the most important drainage channel of the Cordilleras towards the latitude 41° 30'.

Between the Cochamo and Manso headwaters the Cordillera presents many narrow ridges, running most of them in a southerly direction or

with a slight deviation to the east, as the Fortaleza range, which is cut down by the Manso valley at the foot of the imposing Bastion mountains, where porphyric conglomerates have been found, while near its top strata may be seen apparently composed of volcanic tephra. All these ridges are divided from each other by deep gorges, the bottom of which is occupied by streams or lakes of minor importance; such ridges are of medium height, save some portions of the Quemado and Fortaleza ranges that rise above the snow-line.

As I have said before, there is no southerly extension of the orographic mass of Mount Tronador in the shape of a well-defined mountain chain; it is, therefore, rash to speak of a main range of the Cordillera as connecting that important mountain with any one of the ranges or ridges that terminate at the depression of Manso valley; the continuance of that orographic mass is much more apparent towards the east, where a series of ranges surpassing 6500 feet in height, amongst which the parting of the waters to opposite oceans takes place, are connected with the main mountain by the already mentioned link, the lower point of which is the Barros Arana pass. If we follow the water-parting range to its subsequent southerly bend, we have to cross a lengthy but narrow longitudinal depression, the northern half of which is occupied by Lake Gutierrez, drained to Nahuelhuapi, and a southern one by an arm of Lake Mascardi, both lakes lying at a little over 2600 feet above the sea, and being divided by an insignificant swelling of the ground. There we have what may at first appear as a very uncommon and capricious run of the main continental water-divide, but which has been ascertained in these last years to be a common occurrence, not by any means confined to the southern latitudes in the Andine system. Coming down from a high and dentellated ridge, with peaks more than 7000 feet high, the divide crosses the aforesaid depression and then goes up again to another ridge with high peaks, among which there is one called "Cerro Tristeza," nearly 8500 feet high. This peculiarity of the water-divide may be explained, in my opinion, by the greater activity of the fluvial erosion on the Pacific side, where the heavy rainfall, driven with great force by the prevailing westerly winds, combines to work in a receding direction, that is to say, up-stream, with the final result of shifting the whole divide from west to east. It may then have happened that whole basins, like that of Lake Mascardi, drained formerly towards Nahuelhuapi, have been captured towards the Pacific slopes.

I shall now give some particulars about the Puelo and Manso Cordilleras, following the same order of route as in my two expeditions undertaken in 1895 and 1896 in company with Dr. Krüger and Dr. Reiche.

The river Puelo, like all the other main watercourses of Western

Patagonia, shows the type of a non-graded slope river—that is to say, has not attained its mature or normal slope. The longitudinal section of this, between the headwaters and the seashore, does not form a regular curve, beginning with the greater declivities and exhibiting more and more gentle ones as it nears the coast. On the contrary, its upper, middle, and lower courses show independently a succession of alternating rapids, waterfalls, smooth waters, and lakes, through which the river runs. The proper lower course of Rio Puelo is only a short stretch of 5 miles between the river mouth and the beginning of a succession of large rapids within reach of the tides. Usually the river is about a quarter of a mile wide, the depth being 3 fathoms and the current some $4\frac{1}{2}$ miles an hour. On both sides of the mouth



PRIMEVAL FOREST IN THE CENTRAL CISNES VALLEY.

there are great alluvial beds, mostly formed by volcanic detritus and well wooded. Gigantic pieces of volcanic conglomerate are also scattered through the country, and it may be observed that even such of those as are well out of reach of the tides are materially impregnated with minute sea-shells, as it occurs usually with submerged rocks or with those covered by the high tide. This seems to be a sure indication of oscillations in the sea-level, that in a former period must have covered all these alluvial grounds up to the foot of the neighbouring hills. In fact, many other indications of a similar rising of the coast, such as old shore-lines, decayed sea-shell banks, etc., are frequently to be met with along all the littoral as far as the straits of Magellan.

The plains and meadows at the river-side of the Lower Puelo are

covered by many farms and wooden cottages, where some three hundred settlers, nearly all of them Chilotes, reside. They have cleared the timber to a great extent for their growing of potatoes and wheat, and their cattle graze in the neighbouring forests. Their chief business is to work in the woods. They are untiring in exploring the "montaña" (forests) behind their cultured plots in search of alerce and ciprés, that are not now usually found but in remote recesses of the mountains and at a considerable height. Sometimes they combine in small parties of woodmen, who, after finding some good place for lucrative work, go to settle near it for a summer season, build some primitive huts, and bring with them all the necessities of life. Whole families of the more southerly part of Chilce proceed in the same way to places near the rivers Palena, Aisen, etc., to extract from the innermost recesses of the seaside mountains their most valuable timber. The boards from the alerce and ciprés, roughly trimmed on the spot, are brought for sale to Puerto Montt, Calbuco, Melinka, or other ports of the region.

Going on now towards the interior of the Cordillera in the Puelo valley, we shall have to fight our way up the long and dangerous rapids, or go around by the southern bank between some low chains of hillocks and deep depressions, where the growth of the quila brushwood is almost impenetrable. We arrive then at the first lacustrine basin filled by the lakes La Poza and Taguatagua in the direction of the Puelo valley, at the bottom of a hollow depression amidst the Andine system.

I wish to call attention to the fact that, throughout all the Andine region with which we are now dealing, the direction alluded to, that is from north-west to south-east, obliquely to the general bearing of the Patagonian coast-line, is a predominating one in most of the main valleys, as may be observed in important sections of the rivers Puelo, Vodudahue, Reñihue, Yelcho, Corcovado, Lower Palena, Carrileufu, Cisnes, and Mañuales. Some of the large inlets of the coast and sea-arms between mountainous islands and the mainland keep close also to the same bearing, as may be seen with respect to Comau and Reñihue inlets, Yacaf channel and Aisen inlet. This concordant disposition of the main Cordilleran depressions, as well as its parallelism with some of the most prominent and continuous Cordilleran ranges, seems to be an indication of the direction being also that of the earliest mountain system of the Andes, the more so as it is coincident also with the direction of the low ranges of primary crystalline rocks lying in the so-called Pampa Central of Argentina, and with that of the coast-cordillera ranges in Chile.*

(To be continued.)

* See Siemiradzki, "Eine Forschungsreise in Patagonien" (*Peterm. Mitteil.*, 1893, p. 49-62).

IN THE HEART OF BORNEO.*

By CHARLES HOSE, Resident of the Baram District.

In the month of April, 1884, I entered the Sarawak Civil Service, and was given an appointment as extra officer for the Baram district, under the Resident, C. C. de Crespigny.

This territory, which formerly belonged to the Sultanate of Brunei, had been ceded to Sarawak about eighteen months before my arrival. Promoted to be Officer-in-Charge four years later, in 1890 I was appointed Resident of the District, and have held that post up to the present time. It is part of a Resident's official work to visit the people of the interior from time to time, which necessitates tedious and difficult journeys. It is chiefly owing to these long inland expeditions that I have been enabled to observe the habits and customs of the people, and by degrees to construct a detailed map of the interior, which has taken many years to complete.

The Baram district is situated in the northern part of Sarawak, between lats. 3° and $4^{\circ} 30'$ and longs. 113° and $115^{\circ} 30'$, with an area of about 10,000 square miles, and a coast-line of 100 miles from Kidurong point to Baram mouth. On the north side it is bounded by the remaining portion of the Brunei territory and the Limbang district; on the south by the Bintulu and Rejang district; and on the east—on the other side of the watershed—by the Balungan district in Dutch Borneo.

A glance at the map will show that the Baram, which is the second largest river in Sarawak, rises from the central massif, from which the Rejang on the one hand, and the Batang-Kayan, or Balungan, on the other, take their origin. The river basin lies between long. 114° and 115° E. and lat. $2^{\circ} 45' N.$ and $3^{\circ} 10'$, the mouth of the river is practically at long. 114° E. and lat. $4^{\circ} 37' N.$ The following are the chief mountain masses that bound the watershed of the Baram valley, working from the east round by the south to the west. Mount Mulu, which lies on lat. $4^{\circ} N.$ and long. $115^{\circ} E.$, is the rugged, jagged termination of a range of limestone mountains, which sweeps round to the east and then to the south, and abuts the sandstone Pamabo range, about 10° west of long. 115° ; but is probably continued in the limestone mountain masses of Batu Murud and Salaan. To the north of Mulu are the low sandstone ranges of Matauei (Madalam hills) and Ladan; east of the Mulu range is the remarkable limestone pinnacle mountain Batu Lawei, which, from a base of about 10 or 12 miles in circumference, rises sheer to the height of 8000 feet. The Pamabo range consists of a series of sandstone mountains running south-east, and bends back again to the

* Paper read at the Royal Geographical Society, March 5, 1900. Map, p. 140.

west below lat. 3° N., forming a large amphitheatre which encloses an immense plateau, the Kalabit country, in which the Baram itself takes its main origin; on the southern slope of this range, the Bahau, the largest branch of the Balungan takes its rise. This range continues past the Panawan mountain to the Buding, Bureh, Saat and Kanawang mountains, where it divides into the Kalulong and Dulit ranges; all these mountain ranges enclose the whole of the Madang district, and constitute the watershed of the Rejang to the south and east, and of the Tinjar to the north. Kalulong is continued uninterruptedly down to the Pata hills, and Dulit through Aiah and Skiwa to Mount Selikan. The area thus circumscribed to the east, and to the north at about lat. $3^{\circ} 40'$, is divided by the main stream of the Baram river, at the head waters of which, as we have already seen, is the Kalabit country to the east and the Madang district to the west. The central portion is occupied to the south by the Kenyahs, and to the north by the Kayans. To the north of this is low-lying land, which is part of the great coastal plain of Sarawak.

From the coast-line to about 30 or 40 miles inland, the country is flat, swampy, and uninteresting. On account of the poor quality of the soil it is but sparsely cultivated, sago being its chief and almost sole product. Occasionally this plain is relieved by isolated mountains of lime- and sand-stone, rising to a height of 1500 feet, such as Mount Subis and Mount Lambir. In the limestone mountains, which are at no great distance from the coast, are numerous caves inhabited by thousands of swifts (*Collocalia*), the nests of which are exceedingly valuable, and are exported to China in large quantities. During the months of March and April the birds migrate, according to native belief, from the necessity of finding some particular description of food which enables them to produce the glutinous substance from which the nest is built.

The principal Government station in the Baram district is Claudetown, on the Baram river, about 60 miles from the sea. The country round about Claudetown is more hilly, and although the soil is not nearly so good as that further inland, the natives—principally Dayaks—grow fair crops of padi, maize, and yams, and the land appears to be well suited for irrigation. The country varies but little for perhaps 20 or 30 miles further inland, but the Mulu range of mountains, rising to the height of 9000 feet, and the river, with its beautiful but dangerous rapids and waterfalls, lend elements of picturesqueness to the scenery.

On November 10, 1898, accompanied by Drs. McDougall and Myers, members of the Cambridge Anthropological Expedition, I set out for the Madang country, a hitherto unexplored district, lying between the headwaters of the Batang-Kayan, Rejang, and Baram rivers, and inhabited by the Madangs, a warlike tribe of Kenyahs, who by constant raids had become the terror of all the surrounding country. The chief

things to be considered appeared to be, the distance we had to travel and the difficulty of safely navigating the dangerous rapids. As the Madang chiefs had met me on several occasions, I had little doubt that they would receive us in a friendly manner; but the Kayans who accompanied our party were of a different opinion. Many of them returned home after fifteen or sixteen hard days in the boats, making various excuses to disguise their fear of a hostile reception, which was the real cause of their desertion. On the other hand, the Kenyahs, under Tama Bulan, the most important chief in the Baram, were anxious to go right through to the journey's end, and he and about fifty of his men behaved admirably, and would not leave me till we reached home again. The Kenyah and Kayan district is lovely, undulating



LIMESTONE CAVE—HAUNT OF THE SWIFTS.

country, fertile, and covered with old jungle except in places near the banks of the rivers where it has been cleared and cultivated by the natives.

It will not be necessary to say much about the country through which one has to pass on the main river, as a paper of mine on that part of the district has already been read before the Society.* I will therefore pass over the Kayan country, and confine myself chiefly, on this occasion, to the hitherto unexplored part of the island—the Kenyah Payah, and Madang districts.

At Long Akar I had to part with my Cambridge friends, as Dr. Myers was suffering from fever, and Dr. McDougall was obliged to

* *Geographical Journal*, vol. i. p. 193.

return with him to Claudetown. The country here is mountainous, and I am told by the natives that the soil is very good. The Akar river hereabouts is for many miles a succession of rapids, very difficult and slow of ascent. As a proof of this, I may mention that the up journey takes three days, and the return or descent only four hours. The boats used for this work are merely dug-outs, about 40 feet in length and 4 feet beam, with square bows and stern. To minimize the risk of swamping when shooting the rapids, long thin planks are lashed to the sides of the boat, in the centre of which is a covered shelter of palm leaves bound with rattans, in which all the baggage is kept. The other part of the boat is wet all day, the waves constantly sweeping in as the craft is forced through them. The Kenyahs are very clever in handling these boats, and seldom meet with an accident, while among men of other tribes less skilful there is great loss of life.

It is a most picturesque sight to see a Kenyah boat slowly gliding down-river to the head of a fall, the men standing up and leisurely dipping the ends of their paddles in the water to keep the boat's head straight, and straining their necks to find the best spot to shoot the fall. Then, suddenly dropping down and paddling for all they are worth, the boat dashes into a foaming mass of waves, beaten backwards and forwards in all directions by huge boulders. The roar is deafening, and the water splashes in on all sides. For a moment one feels as if it would be impossible to get through; but the pace tells, and the boat, often full of water, by most wonderful management slips round into a less troubled part, and gives the men time to bale out and prepare for the next rapid.

On the eighteenth day of our journey we reached the Silat river, a large tributary which has its source in the Madang country. At this point a five-peaked mountain—5000 feet—called by the natives Batu Tujo, suddenly rears its crests on the sky-line, while beyond its bulk looms the 7000-foot Batu Siman, the great landmark to the *voyageurs* from Batang-Kayan river to the Baram. The river here is still a noble stream, and from the surface of its broad waters one sees that for miles around the hills have been cleared of jungle by the Kenyahs and sown with padi and native tobacco, which also yields a fair harvest to these indefatigable tillers of the soil. The Madang district which we are now about to enter is broken, hilly ground, of which the mean level is about 1500 feet above the sea. According to native account, it is the part of the country whence successive migrations have taken place. Twenty-one days out from Claudetown we arrived at Long Tabau, the first Madang village we had seen, and entered the Silat, a river of surpassing loveliness. Huge trees covered with fern and parasite plants and festooned with trailing vines overhang the water; masses of gorgeous red rhododendrons flame in the interstices; while on either side, from banks, in places towering to a height of from 20 to 60 feet, creaming cascades stream endlessly over black rocks, and, flashing like diamonds

where touched by the sunbeams, lend the charm of light and movement to a scene of extraordinary beauty. Dense groves of graceful wild sago palms clothe every small hill, and when the padi crop fails, it is on these that numbers of Kenyahs, Punans, and others depend for their means of subsistence.

Though the rapids between the mouth of the Silat and the Long Lata are not nearly so difficult of transit as those met with on the main river, they yet present many formidable obstacles to safe navigation. Vast rock monoliths rising to a height of 30 feet, stud the middle of the stream, great walls of rock projecting from either bank almost meet in the centre, and through the narrow passage so formed, the pent-up



JUNGLE IN THE KAYAN DISTRICT.

waters boil and race with such violence that the most skilful management and immense labour are required to force the boats through.

Five days later we entered the Lata river, a large tributary of the Silat. Here the rapids and waterfalls are the finest that I have met with in Borneo. So steep was the fall and swift the current, so torn and tortured the rushing water by countless obstructions, that no craft, however skilfully handled, could hope to live in such a turmoil, and we had to abandon the boats and continue our journey on foot along the bank of the river. Though the distance was only 12 miles, a day and a half were occupied in walking along the side of one rapid, which was only one of a series, so broken and precipitous is the country through which the river forces its way to the lower levels. At the head of this rapid we found a number of Madangs awaiting us with a

very small boat which they had hewn out of a tree the day before, having a few days previously heard of our advent. They invited me to sit in this boat, while, by means of rattan ropes secured to stem and stern, nine strong men—jumping from rock to rock in the most marvellous manner, swimming about in the water, and crossing the river from side to side in their erratic progress—hailed me along over huge rocks and swirling rapids, for ever warning me the while, to keep my hands inboard for fear of getting my fingers jammed against the boulders. When seated right on the bottom of the boat, it was only large enough to contain me, while my body alone acted as a barrier to prevent the water, sweeping copiously over the bows, from flowing into the stern. After about four hours of this peculiar travelling, we reached Long Purau, where we stopped for a time at a Madang village to dry our clothes and collect our property. Here, the country being more open, the rapids were much less formidable, and once more we were able to take to the ordinary up-river boats, many of the party, however, preferring to walk, as the jungle track was a good one. The following morning we passed the last rapid, the river opening out into wide reaches each of which was studded with numerous small islands and gravel beds, and towards evening we arrived at the principal Madang village.

This village, which contained about two thousand people, consisted of nine long houses forming a circle, the centre of which had been cleared of shrubs and trees. For a considerable radius outside this ring the jungle had been felled, and the land was farmed on that side which was more or less bounded by the river, the settlement, it was evident, having been laid out on a plan best calculated to resist attack. The Madangs came down in great numbers to have a look at us, and the chief, Tama Usun Tasi, invited me to take up my residence in his house. My Kenyah friends had not yet arrived, but I thought it best to go with him at once, and afterwards congratulated myself on my decision when I found that, according to custom, Tama Bulan and his followers—being unable to enter the houses until all cases of blood-money between his people and the Madangs had been settled—were obliged to camp near the river for one night. The Madangs assisted in making huts for my followers, gave them several pigs, and sent down their women laden with baskets full of rice, so no want of hospitality could be said to mar our reception.

In the evening I took a walk round the village, followed by a crowd of women and children, who appeared greatly pleased to find that the white man was able to converse with them. Then, as the crowd increased, I sat down on a log and produced a few pounds of tobacco, and the whole party were soon chatting and laughing as if they had known me for years, instead of my being the first European they had ever met. I have often noticed that the women of the Kenyah tribes in the interior are far more genial and less shy than those of others, and I believe that the

surest sign of the good faith of natives such as these, is when the women and children come out to greet one unattended by the men. The sounds of our merriment soon attracted the attention of the men, and as they strolled over and joined us in gradually increasing numbers, the possibility of any disturbance taking place between these people and mine quickly vanished from my mind.

Just across the river from where we were sitting was the graveyard, and there I witnessed a funeral procession as the day was drawing to a close. The coffin, which was a wooden box made from a tree-trunk, was decorated with red and black patterns in circles, with two small wooden figures of men placed at either end; it was lashed with



MADANGS ON A JUNGLE PATH.

rattans to a long pole, and by this means was lifted to the shoulders of the bearers, who numbered thirteen in all, and who then carried it to the burying-ground. After the mourners had all passed over to the graveyard, a man quickly cut a couple of small sticks, each 5 feet long and about an inch in diameter. One of these he split almost the whole way down, and forced the unsplit end into the ground, when the upper part opened like a V, leaving sufficient room for each person to pass through. He next split the top of the other stick, and, placing another short stick in the cleft, made a cross, which he also forced into the ground.

The funeral procession climbed the mound on which the cemetery was situated, passing through the V of the cleft stick in single file. As soon as the coffin had been placed on the stage erected for the

purpose, the people commenced their return, following on one another's heels as quickly as possible, each spitting out the words, "*Pit balli krat balli jat tesip bertatip!*" ("Keep back, and close out all things evil, and sickness") as they passed through the V-shaped stick. The whole party having left the graveyard, the gate was closed by the simple process of tying the cleft ends of the stick together, and a few words were then said to the cross-stick, which they call "*ngring*," or the wall that separates the living from the dead. All who had taken part in the ceremony then went and bathed before returning to their homes, rubbing their skins with rough pebbles, the old Mosaic idea of the uncleanness of the dead, as mentioned in Numbers (chap. xix.), evidently finding a place among their religious beliefs.

It is apparently a great relief to their minds to think that they can shut out the spirit of the deceased. They believe that the spirit of the dead is not aware that life has left the body until a short time after the coffin has been taken to the graveyard, and then not until the spirit has had leisure to notice the clothes, weapons, and other articles belonging to its earthly estate, which are placed with the coffin. But before this takes place the gate has been closed.

The Madangs are a very light-skinned people, with bright, dark eyes and perfectly straight, long black hair. They are fairly tall for Borneo natives, and very muscular, clean, and free of the skin diseases so common among Dayaks, Kayans, and Muruts. They are energetic and quick in their movements, splendid boatmen, and able to travel long distances in the jungle on foot without apparently becoming much fatigued. When meeting one on a jungle track, each man greets you as he passes by, with the word "*Sayeh!*" which means that he hopes no harm will befall you—which may be taken as characteristic of their generally courteous bearing. Their only garments consist of coats and waistcloths made from the bark of a tree known as "*kumut*," which is beaten out to a thin cloth with a wooden mallet. The women also use this bark cloth for their petticoats, and for the shawls in which they wrap their babies. They wear carved ear-ornaments made from the beak of the helmeted hornbill (*Rhinoplax vigil*), and also of resin obtained from the forest trees. They live in much the same manner as the other Kenyah tribes—in long houses holding thirty to fifty families in each house—but own no slaves, and the chiefs and sons of the headmen all appear to do as much work as any one in the village, their occupations including the cultivation of their extensive padi farms, and tobacco, of which they plant sufficient for their wants. They are pleasant people to meet, being good speakers—both as to the matter and manner of their orations—frank and open in their bearing, genial, high-spirited, and possessed of an abundant sense of humour. As a rule they are not polygamous, treat their women almost as equals, and are very fond of their children. They are kind and gentle nurses to

the sick, temperate, and, in a word, a good people when nothing occurs to awaken their fiercer passions. On the other hand, they are easily roused, and, when their blood is up, are ready to dare and do anything, and to fight with amazing fierceness and tenacity. But, as a general rule, their gusts of rage are but short-lived, and they are very ready to give quarter in battle. Many of these people suffer from goitre, for which they use a salt obtained from the Kalabits, as a curative; but owing to the impenetrable swamp between the two districts, they have to procure this commodity through the Leppu Modongs and others, with whom they also are on friendly terms. It is worth noting that the Kalabits, who habitually partake of this salt, do not suffer from goitre.



A MADANG TOMB.

On the following morning several parties of Madangs from other villages came in, numbering in all about six hundred, and exchanged presents of weapons with my people. It was necessary that the gods should be consulted as to whether the meeting was really in the interests of peace or not, so a pig was caught and tied by the legs, and when the Madangs had all assembled in Tama Usun Tasi's house, the pig was brought in and placed in front of the chiefs. Then one of the headmen from a neighbouring village took a lighted piece of wood and singed a few of the bristles of the pig, giving it a poke with his hand at the same time, as if to attract its attention, and calling in a loud voice to the Supreme Being, "Balli Penylong." Then, talking at a great rate, hardly stopping for a moment to take breath, he asked if

any one had evil intentions the truth might thus be revealed before the evilly disposed one was allowed to enter the Madang houses, and that if any Madang, either relation of his or not, wished to disturb the peace which was about to be made with the Baram people, let him be shown up. The old man stood waving his hands in a circle as if to cover the assembled crowd, and, jumping in the air with great violence, brought both feet down on the plank floor with a resounding thump; then, spinning round on one foot with his arm extended, he quickly altered the tone of his voice to a more gentle pitch, and, quivering with excitement, quietly sank down into his place amid a dead silence. The speech was a stirring one, and created an impression; others spoke a few words to the pig, and it was then taken to one side and stabbed in the throat with a spear, after which the liver was taken out and examined. I should mention that a pig was also provided by the Madangs for our people (who were waiting to be invited to the house) for the same purpose. Having years before studied the beliefs of the natives with regard to divination by pigs' livers, I must say I was as anxious as any one to see the results.

I saw at a glance that the omen was good, and seized the opportunity of making the most of it. I quickly called the people's attention to all the good points before they had given their own opinion, and at once saw that their interpretation was the same as my own, and that they were somewhat surprised to find it so.

I then retired to the camp of Tama Bulan and my own people, whom I found had not got nearly such a good liver from their pig, so it was decided to ask for another, which was readily given, and, this pig proving to be exceptionally good, every one was satisfied. Then two men messengers were sent backwards and forwards to discuss the numbers of people killed on either side from time to time, and big gongs, shields, and weapons of all kinds changed hands as blood-money. When all had been settled, notice was given to our people that the Madangs were ready to receive them into their houses, and our people sent a message back that they were prepared to accept the invitation.

With the Kayan and Kenyah tribes, when enemies meet it is necessary to go through a sort of sham fight, called *Jawa*, so that both parties can, as it were, blow off steam; as it is very rough for a few minutes, it often happens that some people are badly hurt, and I was half afraid that such might be the case in the present instance. But the omen had been favourable, and the implicit belief in such omen goes far to prevent bad feeling. About midday, Tama Bulan and his followers, in full war-costume, announced their intention of moving by a tremendous roar, bursting into the war-cry, which was immediately answered by the people in the houses. The noise and excitement increased as our party neared the house, and guns with blank charges were fired. On came the Baram people, stamping, shouting, and waving their weapons in

defiance, the Madangs in the houses keeping up a continuous roar. When the Baram people first attempted to enter the house they were driven back, and a tremendous clashing of shields and weapons took place, the Madangs retreating further back into the house, stamping and making the most deafening noise. When the Baram people had all entered, the Madangs once more rushed at them, and for perhaps two minutes a rough-and-tumble fight continued, in which many got knocked about. No one received a cut, however, except one man who, running against a spear, was wounded in the thigh; but the affair was quickly settled by the payment of a pig and a small spear to the wounded person, so the ceremony may be said to have ended without a mishap.



MADANGS SHOOTING WITH THE KELEPUT (BLOWPIPE).

When quiet had been restored we all sat down, and *borak* (rice spirit) was produced, healths drunk, and speeches made, which occupied the rest of the day and continued far into the night, and during this entertainment cooked food was brought out and given to the visitors in the long verandah, as, on first being received, visitors are not allowed to enter the rooms.

The next day we visited the other Madang villages, and saw many things of interest. I noticed a large wooden figure outside most of the houses, with numbers of knotted rattan strings tied to its neck, and upon inquiry was told that the figure represented "Balli Attap," a god who prevented all kinds of evil from falling on them; that each rattan string corresponded to a family, and each knot to an individual. The neck of the figure was covered with these strings. I also saw a man

making earthenware pots by a curious process that was new to me. He did not use a wheel, but built up the clay gradually, using a curved stone on the inside and a flat piece of wood slightly grooved on the outside, by means of which he produced a design somewhat resembling network, the clay being afterwards burnt in a charcoal furnace blown with bellows made of bamboo. The largest pots that came from his hands would hold perhaps a gallon, and the smallest about a quarter of a pint.

In the evening the Madangs prepared a feast for all present, and afterwards a great deal of rice spirit was drunk, and some very good speeches made, their former troubles and differences being explained and discussed in the most open manner. Each chief spoke in turn, and con-



WARRIORS PREPARED FOR THE JAWA.

cluded by offering a drink to another, and singing a few lines of eulogy—the whole assembly joining in a very impressive chorus at the end of each line, and ending up with a tremendous roar as the bamboo cup was emptied.

The following day the Madangs collected a quantity of rubber for their first payment of tribute to the government, namely, two dollars per family, and as we had no means of weighing it except by guesswork, it was decided that Tama Bulan and two Madang headmen should act as assessors, and decide whether the piece of rubber brought by each person was sufficiently large to produce two dollars. It took these men the whole day to receive it all, and much counting was done on the fingers and toes. I would mention that their method of counting

is as follows: Some one mentions the names of the heads of all the families in each house, and as he does so a man tells each name off on his toes; when five have been counted, another man catches hold of the counted foot, and so on until his feet and hands have all been told off, when another man is used, and this continues until all the names are mentioned, when they halt to see how many men have been used, and where the last one ended. The people whose business it is to hold the feet and hands cling on to them in the most determined manner until the total number has been checked, and as all concerned take the matter most seriously, it is rather a comical sight when they have to count forty or fifty.

In the afternoon, the atmosphere being clear, I climbed to the top of a small hill, about 400 feet, and was able to take a number of bearings of the mountains visible, and fix the position of many of which I had taken the bearings from the head of the Tinjar river some years before. I give the position of several mountains, varying from 4000 to 8000 feet, which have been hitherto unknown. The highest mountain in this district is Mount Tebang, whose summit is 10,000 feet above sea-level. The range forms the watershed between Dutch territory and Sarawak, the sources of the Rejang and Baram rivers being on the Sarawak side, and those of the Batang—Kayan, and Mahakam—a large tributary of the Koti—on the Dutch side. In the Madang district are two isolated limestone mountains, Batu Puteh and Batu Maloi. The following are the principal peaks in the Madang and Kalabit districts, most of which can be seen from the Lata hills.

	Height.	Long.	Lat.
	Feet.		
Sant	5,000	114° 54' 0"	3° 8' 0"
Kanawang	5,000	114° 50' 0"	3° 9' 0"
Bura	6,000	114° 58' 0"	3° 7' 30"
Boding	3,000	115° 11' 0"	3° 9' 0"
Modong Bureh	5,000	115° 3' 30"	3° 6' 0"
Tepar	3,000	115° 8' 0"	3° 7' 30"
Bela Lawing	7,000	115° 31' 0"	3° 16' 0"
Batu Liehun	8,000	115° 39' 0"	3° 21' 0"
Batu Tujo	4,000	115° 2' 30"	3° 20' 0"
Batu Siman	5,000	115° 5' 0"	3° 20' 0"
Budok Batu	2,000	115° 27' 0"	3° 22' 30"
Budok Bayang	4,000	115° 30' 0"	3° 26' 0"
Bodok Wa	3,000	115° 32' 0"	3° 28' 0"

The country between the Madang and the Kalabit districts to the north, except for an occasional small hill, is very flat, and I am told by the natives that part of it is a large swamp extending for about twenty miles to the north and north-east. The Kalabit district is a plateau that has a general elevation between 2000 and 3000 feet. Of this the western half is an uninhabited swamp, while the eastern half is

flat and very fertile and the natives cultivate the whole of it. By means of a clever system of irrigation they obtain two crops in the year, an agricultural feat which no other natives of Sarawak accomplish.

At the level of the Lata river at Long Pura, I found we were 1876 feet above the sea. The air was fresh and pleasant, and, judging from the appearance of the people, the locality possesses a healthy climate. The temperature, though differing but very little from that of the low country during the day, dropped considerably at night, and was, we found at times, quite cold.

On taking our departure from the Madang country, most of the women presented us with a small quantity of rice for food on our homeward journey, but as each little lot was emptied into a large basket, the giver took back a few grains so as not to offend the omen birds, who had bestowed on them a bounteous harvest, by giving the whole away to strangers. Presents of considerable value were given on both sides, and all parted the best of friends. The two principal Madang chiefs accompanied us for a day's journey, their followers carrying the whole of our baggage. On parting I promised to allow a similar peace-making at Claudetown, at which most of the Baram chiefs would be present, and I am glad to say was able to arrange for it to take place and to secure an assemblage of six thousand people, during the time that Dr. Haddon and the members of the Cambridge Expedition were staying with me. The ceremonies of the peace-makings, though of course on a much larger scale, were similar to that I have described at the chief Madang village. At one of these meetings Saba Irang of the Madangs made a very eloquent and remarkable speech, in which he explained that his people had for years been compelled to fight on all sides in order to hold their own, but were now fully able to appreciate the benefits of peace under the Sarawak Government, and of friendly intercourse and trade with the peoples of the Baram and surrounding districts—a condition of things which he would do all in his power to strengthen. As a matter of history, the Madangs have from time immemorial been at enmity with the people of the upper waters of the Rejang, Baram, and the Batang Kayan, but now the Sarawak flag flies in the Madang country, and over two hundred Malay traders have gone there during the past year. Large quantities of jungle produce are being worked by the Madangs, and these very people, once so hostile to all, are now being used as a means to bring about friendly relations between our people and the border tribes.

It is only a few months ago that I received a message from Tama Kuling, the principal chief of one of the most important border tribes of the Batang Kayan, accompanied by a clod of earth, symbolizing the identity of his people with the races of the Baram. The message he sent (translated literally) was to the effect that his people were really the same as the Baram people, and that they were on the same soil.

They had been divided and made enemies on account of mistakes and the foolishness of unimportant headmen, but he was anxious to meet the Baram people and glad to make peace. He intended visiting us at Claudetown, and if the Baram people wished to trade with the inhabitants of his district, he would be responsible for the former's safety during their sojourn in the Batang Kayan. This is a practical demonstration of the benefits accruing to trade by the settlement of blood-feuds, and it was to endeavour to bring peace to communities whose normal condition was one of mutual hostility, that the journey I have attempted to describe was chiefly undertaken. It was a great source of satisfaction to me to have so thoroughly succeeded in my object, but



PUNANS AT HOME.

another pleasure—perhaps the greatest pleasure one experiences in travelling among barbaric peoples—was to have seen and met an interesting race in their natural state, using their home-made implements and weapons, and wearing their simple clothing of bark, before the appliances of modern manufacture and the cotton goods of England and Germany have penetrated their solitudes, and in a sense vulgarized by removing them, if by only one step, from their unaffected primitive condition. It was also a great gratification to behold for the first time a new and unknown country, with all its wealth of natural marvels and scenic beauties, of which even an eloquently written and detailed description would convey but a very inadequate idea.

The fauna of the Baram district is exceedingly rich in all branches,

the most important mammals being the maia or orang-utan, the lemurs, cats, otters, bear, porcupines, the rhinoceros, wild pigs, wild cattle, deer, and *pangolin*. Among small mammals are found bats, shrews, rats, and squirrels; while round the coast one meets with dolphins, porpoises, and dugongs. Of birds, Baram has nearly five hundred species, including many kinds of thrushes, flycatchers, swifts, cuckoos, barbets, hawks, owls, pigeons, pheasants, and herons.

The rivers abound with varieties of fish, and tortoises and crocodiles—the latter in undesirable profusion, in spite of the rewards (36 cents per foot measurement) offered by Government for their capture and extermination—are to be met with in their waters. Over seventy species of snakes exist in the Baram district, but notwithstanding the fact that several of the varieties are poisonous, it is a rare event to hear of fatalities as the result of snake-bite. In the jungle—which teems with insect-life, including many beautiful examples of mimicry—we find orchids of the most exquisite description, gorgeous rhododendrons, and the most lovely ferns and pitcher plants.

It may perhaps be of interest to give some figures with regard to the trade of Sarawak, for, though in themselves of less attraction than some other details I have touched upon, they assist in building up a conception of the country. In 1888 the value of the total trade of the country amounted to \$3,957,750, and in 1898 to \$9,174,898, an increase of \$5,217,148 in the ten years, or equal to over 130 per cent.

The figures for the principal articles of export in 1898 were as follows:—

	Quantity.	Value.
Gutta	3,745 pikuls*	\$275,738
Rubber	3,725 "	367,014
Rattans	35,699 "	189,291
Gambier	30,845 "	171,346
Pepper	18,890 "	736,760
Sago flour	251,200 "	756,275

The total imports amounted to \$4,488,497. The revenue of the country in 1898 was \$638,188.68, and the expenditure \$543,506.56, leaving a surplus of \$94,682.12. The revenue increased over that of the previous year by \$73,399.35, and the expenditure by \$39,405.88.

Large works have recently been erected by the Borneo Company at Bau for the purpose of working gold by the cyanide process, the value of the output averaging about £200 a day. Antimony and cinnabar are also worked with excellent results. A factory for the purpose of making cutch—a dye produced from the bark of various mangrove trees, which abound in almost all the river deltas, has of late been very successful, and supplies added proof of the valuable and practically inexhaustible

* A pikul equals 133½ lbs.

resources of the jungle, and the rewards that await all who know how to turn them to account. The natural resources of Sarawak are enormous, and, provided the present system of government continues, are alone sufficient to ensure the future prosperity of the country. For the present the jungle furnishes the natives with all the raw produce necessary for their domestic needs and for purposes of trade, with the minimum amount of labour. But as the more accessible tracts and districts are worked out, the natives will be compelled to leave their beaten paths and penetrate into the denser wilderness, and, by making new tracks and clearings at a greater distance than heretofore from the established coastal and riverine settlements, will automatically open up the country and greatly facilitate the work of the prospector. Judging from known indications, this process is likely to result in important discoveries of new sources of mineral wealth, for the density of the virgin forest covering the greater portion of the country has up to the present time prevented anything like exhaustive investigation.

The two good coal-mines at present being worked in Sarawak are important factors in its industrial welfare. They add to its political value by enabling the territory to become a maritime coaling-base, and will greatly assist in the working of minerals and in the various processes to which most crude products have now to be subjected.

Another benefit accruing from the opening up of the jungle and the gradual exhaustion of jungle produce, will be the greater attention given to the magnificent timber with which the country abounds. Some of the most rare and valuable woods in use at the present day grow in profusion in Sarawak, but, owing to the causes lightly touched on above, have not received due prominence, though the present exportation of timber from the Rejang district is considerable, and is increasing year by year. Three facts with regard to the industrial population are attracting attention at the present time, one being the gradual but certain worsting of the Malay in trade by the Chinaman; secondly, the rapid extension of the Dayak northwards to the Baram and Limbang rivers; thirdly, the immigration of natives of Hindustan.

Unless present indications are falsified, it would seem that in time the Malay is bound to disappear as a factor in the industrial life of the community. In all directions we see the industrious, sharp-witted Chinese merchant displacing the Malay from his former avenues of trade, and while emphasizing the many intellectual and amiable qualities of the Sarawak Malay, it must be admitted that his ingrained dislike for sustained effort in work of any kind, his want of energy and foresight, and his tendency to live a life of indolence, and to rest satisfied on inherited or too easily earned gains, are the chief causes of his rapidly decreasing prosperity.

The present system of Government, which may be said to have taken for its text Sir James Brooke's famous utterance, "We aim at the

development of native countries through native agency," viewed from that standpoint, has, I consider, more than amply justified its existence.

The various races of Sarawak are for the most part gifted with considerable intelligence, and it did not take them long to discover that the main object of the State's solicitude was, not the commercial exploitation of the country or the amassing of colossal revenues, but the preservation and well-being of the people themselves, and that coercion was a dead letter for all save the disturbers of the general peace and the enemies of the commonweal. Since that belief was firmly established, native public opinion has always been on the side of the Government, and it is on the moral force of that public opinion that the whole framework of the system rests. So appreciative are the natives generally of the peace and security enjoyed by the Rajah's subjects, that many of the border tribes, and even tribes definitely beyond the confines of the territory, have from time to time petitioned to be allowed to take up their abode under his flag.

It is the Government policy—once a respect for law and order is instilled into the native's mind—to interfere with him as little as possible as regards his (harmless) customs, habits, and beliefs, and no attempt is made to foist Western civilization on a people for whose needs it is utterly unsuited.

As compared with more recently founded states and colonies, Sarawak may appear to make but slow progress, both in regard to material prosperity and what many regard as the desirable advancement of the natives. It should be emphasized, as regards the former, that no comparison is just that is instituted between Sarawak and any territory in which the well-being and preservation of the native inhabitants is not made the first and foremost consideration; with regard to the latter, it comes to a comparison of different points of view as to what *does* constitute desirable advancement.

As to the wisdom of the point of view obtaining in Sarawak, the existence of the administration furnishes conclusive evidence, for it is a government of the people for the people by Europeans, supported by public opinion; such a system would be impossible, however, were it not for the firmly established prestige of the Europeans, and this, and the fact that the confidence of the natives has been won and retained by an unbroken record of promises fulfilled and benefits bestowed, are the secrets of this administration.

Very little is known about the geology of the mountain ranges of the interior of Borneo, but it appears as if most of these mountain chains and their spurs are composed of crystalline schists; these are the rocks usually spoken of as "old slate formations," which are probably of Devonian age, but some may be Archæan, while others may belong to those Lower Carboniferous rocks that are called the culm-measures by

some authors. Associated with these are igneous rocks, mainly granites and diorites, and also gabbros and serpentines, but these latter appear to belong chiefly to the spurs. The older crystalline rocks are very generally gold-bearing.

It is probable that the great amphitheatre of sandstone mountains that commences with the Pamabo range and forms the southern watershed of the Baram basin—to divide at Mount Kanawang into the Kalulong and Dulit ranges—is composed of Palæozoic sandstones, probably of Lower Carboniferous age. Granite and basalt occur on the southern flanks of Dulit, and antimony has recently been found there.

The mountains north of this sandstone range are most probably



DAYAK GUTTA HUNTERS.

carboniferous limestone; their culminating point being Mount Mulu, which attains a height of 9000 feet. The Mulu range is somewhat crescentic in its general trend, being open towards the east. Beyond the Pamabo range are the mountainous outliers of Asi, Batu Murud, and Salaam. The isolated mountains in the Madang country, Batu Puteh and Batu Maloi, are connected with the same system. The intermediate mountain ridge which culminates in Mount Tamuduk (4000 feet) is of sandstone formation, as it has the characteristic even skyline of the sandstone mountains of these parts, so different from the peaked contour of the limestone mountains.

The hard blue carboniferous limestone contains characteristic fossils

in scattered localities, and occasional seams of coal. The sandstones also contain coal in places, as, for example, in Mount Dulit. The rocks are traversed by numerous calcite veins and by ore-bearing veins, which generally contain antimony. Slates are also interbedded with the limestone, and perhaps also with the sandstones.

No secondary formations have been described from Sarawak, though Jurassic and Cretaceous rocks occur in Dutch Borneo.

To the north again of the carboniferous limestone mountains are sandstone hills, which range up to 1000 feet in height. These are Tertiary rocks, which Verbeek now regards as belonging to the Eocene. Where they occur in Borneo they are usually of a white or yellow colour, and contain flakes of a silvery white mica; the cement is argillaceous. They are probably derived from mica-schists. Alternating with them are bands of shale, carbonaceous shale and coal. In many places they are pierced by intrusions of basalts and hornblende-augiteandesites, accompanied with deposits of tuffs and volcanic agglomerates.

These coal-bearing Tertiary sandstones extend north of Mount Mulu through the Matauei and Ladan ranges as far as Mount Pisang on the coast, beyond Brunei, where coal is now profitably worked.

On the Madalam and elsewhere in the basin of the Limbang are limestone rocks, which must be regarded as Tertiary coral reefs.

Towards the plains the Tertiary hills diminish in size and, speaking generally, the limestones are succeeded by bluish-grey clays and shales and marls; the percentage of lime in these beds increases as a whole from below, upwards. The marl beds are regarded by Verbeek as Oligocene, and as equivalent to the Nari group of India.

The marls are succeeded by late Miocene limestones; these are hard rocks, whitish or bluish in colour, usually containing numerous fossils, especially nummulites.

The Quaternary beds constitute the great coastal plain, and were deposited during the last partial submergence of the island. In part they form flat districts, in part gently undulating plains.

The highest bed consists of a somewhat sandy clay, which becomes more sandy below, the sand grains at the same time increasing in size. The lower conglomerates consist mainly of quartz pebbles, but also of pebbles of different igneous rocks; they also contain pebbles of the Tertiary strata, such as sandstones and coral limestone. Between these pebbles there is more or less of a clayey earth. The pebbly bed may be indurated by a very hard siliceous cement. The bedding is horizontal, or, at the border of the hill-land, only slightly inclined.

The river deposits are composed of a dark-brown, black, or bluish clay, which is rich in humus in its upper layers; in the lower layers it is of a harder consistency. It is often mixed with or traversed by seams of sand, the latter, as a rule, occurring on a lower level. The

boundary with the older Quaternary cannot be sharply drawn. The alluvium on the Baram extends for nearly 100 miles from the coast.

Baram Point is rapidly extending seawards owing to the alluvium and drift-wood brought down the river, and the sand heaped up by sea. During the last fifteen years half a mile has been added by these combined agencies. For a distance of about 8 miles from their mouths most of the river-banks in the Baram district are composed of white sea-sand.

Before the reading of the paper, the PRESIDENT said: The subject before you this evening is a journey into the very centre of Borneo, a mountainous country that has never before been explored. It is not necessary to introduce Mr. Hose to you, as he gave us a very interesting paper I think in 1893, which many of you will remember. Major Darwin, the secretary, has kindly undertaken to read the paper for Mr. Hose.

After the reading of the paper, the following discussion took place:—

Prof. HADDON: It was exactly a year ago that my colleagues and myself had the pleasure of being the guests of Mr. Hose. You have seen the photographs of the country and the people, but I think it is only fair I should say something that Mr. Hose could not very well say.

It was sixty years ago that Sir James Brooke took over Sarawak, which was then a small territory, handed over to him by the Sultan of Brunei. Since then the Raj has grown, and it has grown, not by acts of aggression on the part of Rajah Brooke and his successor, Sir Charles Brooke, but by a perfectly natural growth: as Mr. Hose has pointed out, the natives appreciate such a government as that Rajah Brooke offers them. When Sir James Brooke made it his business to administer the country, it was for the natives and by the natives, and it is by that equitable system of government that the country has grown practically without bloodshed and without ill-feeling on the part of the natives. The native chiefs of the Sultanate of Brunei have time after time asked Mr. Hose to persuade the Rajah to take over their territory, and even the Sultan of Brunei himself asked Mr. Hose to help him in suppressing local rebellion; so that the last native state now in Borneo is, from the Sultan downward, asking the Rajah of Sarawak to administer them. Furthermore, the people on the Dutch side have seen how the people of Baram can live in peace and safety, and how they can trade securely and not be cheated by the trader—that is, not unduly cheated—and these people, really technically Dutch, are coming over the border in order to put themselves under the administration of Mr. Hose. Well, I think that is sufficient testimony from the native point of view. The natives themselves, when they first come in under the Government, never refuse to pay the tax, which is very slight—a couple of dollars. It takes a man a very short time to get enough jungle produce to exchange for a couple of dollars. They prefer to pay the tax, because then they can feel they are citizens of the Raj, they really do belong to the Government, and barbarians are by no means fools. They know well that by paying two dollars a year they will have peace, be able to trade, and have all the advantages of a settled Government, and they feel it is really a good investment for their money.

The only things the Government puts down with a firm hand are murder and head-hunting and theft—that is practically all; the natives may retain all their own customs, their religion is not tampered with. I may state that in the whole of Baram, 10,000 square miles, there are only two white men—one is Mr. Hose, and

the other is the assistant magistrate, quite a young man. There are about twenty or thirty Dayak fortmen or police. These people themselves are only one degree from barbarism, and at any moment would like nothing better than to go on the war-path and collect heads; so, as a matter of fact, there is extremely little physical force behind Mr. Hose. It is perfectly evident that this system of government is one which appeals to the natives. Of course they have troubles in the district, and if any of the interior tribes do a little head-hunting, Mr. Hose starts away by steamer as far as it can go; then takes to canoes, and when he reaches the people he simply talks to them. They usually give themselves up or pay their fines—400 to 500 dollars for a life taken. What surprises the natives is Mr. Hose's activity. He never loses a moment; when there is difficulty, he rushes up at once with only a few fortmen; still the people feel he is a man they cannot tamper with, and they give in. It is moral rather than physical force. The people who in the past were inclined to give the greatest trouble are at the present day the staunchest upholders of the Government. Now, districts like these, of course, require many different qualities, and Mr. Hose has entirely taken up the spirit of Rajah Sir James Brooke. Some of the residents—residents are magistrates who rule districts—are merely magistrates in the ordinary sense of the term; that is, they go from the residency to the fort and administer justice, and then go back to the residency. Strictly speaking, of course they ought to travel about; some do to a greater or less extent, but I believe no resident has performed this travelling function of a magistrate to the same extent that Mr. Hose has done. The consequence is, the people look on him not only as the representative of government, but as a personal friend. Now, all the magistrates must learn Malay, and a few learn the chief language of the district in which they happen to be, but Mr. Hose speaks six or seven languages. This, of course, is a very important matter; you can never get at a man's heart if you speak through an interpreter. It is only by knowing the language of a people that you can get at them. Thus, owing to his wonderful energy and enthusiasm for the natives, he has travelled all up and down his district, and knows personally the greater number of natives in his district. They come to him with all their little troubles. For instance, if a young man wants to get married, and is not quite sure whether the heads of his family would approve, he goes and confides in Mr. Hose. I saw a very amusing instance of this when I was with him. Mr. Hose spoke to the headmen and made the customary presents, fixed the matter up, and the young people were made happy. Time after time promising young natives come down on a visit to Mr. Hose, and stay with him for days or weeks at a time, and in this way the people learn what a white man, a respectable white man, is like, and what a government really means. Thus Mr. Hose's residence is a sort of university, whither the pupils come from all parts of his district to learn a little as to the meaning of government. Of course, when they go back they talk about the glories of the fort, of the Chinese bazaar, Mr. Hose's house, his piano, his musical box, and his collections. They are impressed with the power of the white man, and in all these various ways the heart of the people is reached, and they feel it is a privilege to have the white man with them.

I think I have said enough to show what is the system of government in Sarawak.

LORD STANMORE: I have never been in Borneo, I have never even sailed within sight of it, and therefore it may seem a very forward and improper thing for me to meddle with this discussion; but though I have never been in Borneo, I have lived with and governed people who, like those whom Mr. Hose has told you of, wear bark cloth, and live in their primitive manner. When you talk of bark clothes, it

sounds an uncomfortable and scratchy sort of garment, as it would be if of the bark of an English tree; in fact, they are soft and nice; they are beaten out until they make a kind of cloth of greater or less fineness. I do not know what kind of bark is used in Borneo, but in the Pacific it is a bark of a species of mulberry.* By living among them, I learned something as to the way in which they should be governed, and it afforded me great delight to hear to-night that that great province of Sarawak was being governed on what I believe to be the only true and sensible plan of governing native races. According to the words which Mr. Hose quoted from the Rajah, Sir James Brooke, it is a government for the people and through the people, though they need guidance and supervision. I wish merely to express that satisfaction, and my firm conviction—a conviction as strong now as it was when I first tried to apply it in Fiji—that this is the only way in which you can get a moral hold over the native population, and the only way in which you will preserve them. You may advance them gradually on their own lines in their own way; you won't advance them at all by endeavouring to make them something which they are not, and which they never can be. But I feel that these are discussions which rather belong to another place. They are not geography, and cannot be said to be exactly on the lines of this meeting. I merely wish to say with what extreme pleasure I have heard what is the system of government in Sarawak, and I hope it will long continue.

Dr. BOWDLER SHARPE: I should not like the opportunity to pass without testifying, on behalf of the British Museum, to the extraordinary efforts to advance science that have characterized Mr. Hose's residence in Borneo. He has crowded into our museum enormous series of mammals, birds, insects, shells, and every kind of animal. Not only has he given to the British Museum the firstfruits of his work during his sixteen years' residence in Borneo, but there is not a leading museum in the whole world that has not received collections from this indefatigable young man, second only to those given by him to the British Museum, and these donations have proved of great importance to the countries he has benefited. I would just like to say one word as to the country you have been hearing about, and I think I can put the scientific results of Mr. Hose's exploration in a few words. When the late John Whitehead, the great English traveller and collector, went—in 1887, I think, or somewhere about then—to try an ascent of the great mountain of Kina Balu, in the north-west of Borneo, it took that man, great traveller as he was, four years of steady perseverance before he could induce the natives to have confidence enough in him to attempt to get up the mountain, because they were afraid of the spirits of their ancestors, and the dragons that inhabited the top. At last he gained the confidence of the natives, and when he went up he discovered fifty-six new kinds of birds. Then came another great traveller-naturalist, Alfred Everett, who lived for thirty years in Borneo, the predecessor of Mr. Hose in the great work he has done. He died last year, thoroughly worn out from the sufferings he had so patiently endured in the cause of science, and leaving behind him an imperishable name. Both achieved great results, but one of the most extraordinary things as regards zoology was the exploration of Kina Balu by John Whitehead. When Mr. Hose began to make collections in the Baram district, he also found many great mountains, as you will have seen from the map, which he made it his business to explore, and he has opened up a most extraordinary fact—that is to say, that when you look at the line of the Himalayas, and then at the map of Borneo, where you have Kina Balu and Mount Dulit, Mount Kalulong, Batu Song, etc., although there is such

* *Broussonetia papyrifera*.

an amount of sea in between, the birds at least of Mount Dulit and Kina Balu are Himalayan. It is a most extraordinary fact that the line which marks the fauna of the Himalayas from 3000 feet altitude is carried into the mountains of Western China, through Siam and Tenasserim, down the Malay peninsula to the high mountains of Java, Sumatra, North-West Borneo, to Celebes; and now during the last few years, in the high mountains of the Moluccas, you have still this extraordinary Himalayan element above the 3000-feet level, which looks as though at one time it was possible for all these to have formed one continuous chain of mountains, and that circumstances have occurred which have separated them by depressing the valleys, and so they are, as it were, isolated ranges which belong to the same system. I was talking to you the other day of the same phenomenon with the Mackinder collection and the mountains of Africa, where you have the high mountains of Kilimanjaro, Kenya, Elgon, Ruwenzori, and the Cameroons, isolated peaks standing up from the lower country, where you get an identical fauna above the 3000-feet level.

The PRESIDENT: It now remains for us to pass a vote of thanks to Mr. Hose for his interesting paper. The country he has described to us, Borneo, is of great interest to us, as it was to our predecessors in this Society for more than half a century. In our youth most of us read the story of the acquisition of the sovereignty of Sarawak by Rajah Brooke, one of the most interesting and fascinating in our history, and we have probably most of us read the story of Sir Henry Keppel's work in conjunction with Rajah Brooke in H.M.S. *Dido*, in a book which was published much more than half a century ago. I regret that Sir Henry Keppel is not a member of this Society; his brother, Lord Albemarle, was one of our founders, a father of the Society, and for many years on the Council, so that we may, perhaps, be allowed to look upon Sir Henry Keppel as a sort of uncle to the Society.

I have just heard the remarkable fact that this venerable officer has returned to have another look at the scenes of his exploits in Borneo, and has travelled there at the age of ninety-one in H.M.S. *Hermione*, but that when the *Hermione* was about to return to China he refused to go back in her, because he wanted to have a further look round. I am sure the meeting will heartily wish a pleasant visit to Borneo to that splendid old naval veteran, and a safe return to this country before he reaches his ninety-second year. Since his time we have been able to watch the progress of discovery, and within the last ten or fifteen years we have had papers from the late Mr. Daly and Mr. Hose, and now another and more interesting paper from Mr. Hose, after visiting the mountains and highlands of the region in the interior of Borneo, which had never been before explored. I think it a very fortunate circumstance that Mr. Hose should have been accompanied on this occasion by Prof. Haddon, so that a pure and most interesting race of people, uncontaminated by commerce and intercourse with any other tribe, should have been carefully measured by so eminent an anthropologist. I understand that, in order to induce the natives to allow themselves to be measured, he assured them he was ascertaining the length of their lives; no doubt he gave each a very long life to encourage the others. We have to thank Prof. Haddon for giving us an insight into the extremely valuable and important administrative work being done in that region by Mr. Hose, and we must all feel admiration for the solitary Englishman who is doing so great a work among the natives. I am sure you will all wish me to return a very warm and cordial vote of thanks to Mr. Hose for his most interesting paper.

A JOURNEY FROM CHESTERFIELD INLET TO GREAT SLAVE LAKE, 1898-9.*

By DAVID T. HANBURY.

WITH the object in view of crossing and exploring that portion of the Barren Northland of Canada which lies between the head of Chesterfield inlet and Great Slave lake, I left Winnipeg by first open water in the early part of May, 1898. The starting-point for this journey was Fort Churchill, on the west coast of Hudson bay, which was reached on July 6, after an easy canoe journey *viâ* Norway House, Oxford House, and York Factory. To my disgust, and very much to my surprise, I now learnt that it would not be possible to start north by open water until July 20, the earliest date, in average years, when navigation opens on Hudson bay. Two Cree lads, whom I had engaged at Oxford House to accompany me on the journey, and who had gone through the farce of signing contracts to remain in my service faithfully for the period of one year, now pleaded sickness as an excuse for wishing to return to their homes. The whole way along, I knew very well that by every one we met they had been dissuaded from undertaking the journey. Pictures of hordes of cannibal Eskimo devouring raw human flesh had been placed vividly before their imaginations by other Indians, one and all of whom have a dread of approaching "Husky" or Eskimo land. The lads were finally so overcome with horror and dismay at the mere prospect of getting anywhere near such terrible savages as the Eskimo, that I fancy they really were sick from sheer fright. Anyway, men in this condition would be of little service to me. The contract was off, and they returned in a hurry to their people at Oxford House. The Hudson Bay trading boat was to start north for Marble island about July 20. An average trip would take ten days. This would have landed me within 60 miles of the entrance to Chesterfield inlet about August 1—too late in the season, in my judgment, to commence a long journey into an altogether unexplored country. After due consideration, I decided to postpone the journey, and content myself with taking up the canoe, and leaving it in cache near Marble island till the following spring, for I intended to leave Churchill in the spring, and haul up as far as possible on the ice with dogs and sleighs.

The short summer was passed in taking a run up in the Company's trading boat, caching the canoe near Marble island, and in learning as much about the Eskimo—their language and the country to the north—as my time permitted. At the same time I managed to secure from them two trains of fine Eskimo dogs, as it now became necessary for me to take the winter trip to Winnipeg in order to refit and complete my outfit. Before leaving, arrangements were made for Eskimo (or

* Map, p. 140.

Huskies, as I shall in future call them) to meet me at Churchill in the following spring. Two sleighs were also ordered to be made, and other outfit got ready by the time I expected to be back, and on September 5 I bade farewell to Churchill for the winter, no one, I knew very well, expecting to see me return. That concerned me not at all, so long as they got everything in readiness for the projected journey. From Churchill to York the distance is 180 miles, very much more easily accomplished by land than by water.

A delay of six weeks occurred at York, waiting for the "freeze-up," during which time, as soon as the snow fell, I broke in my dogs—several of them never having been hitched up in harness before. On November 8 Hayes river was frozen solid, and as a large amount of snow had fallen, by the advice of my guide, a start was made for Oxford House *en route* to Winnipeg. Travelling in the early winter on the first snows is never good. However, Winnipeg was reached in about a month, delays having been made at Oxford House and Norway House in order to rest the dogs. The distance from York Factory to Winnipeg is something under 800 miles. The latter part of December, January, and most of February was passed in civilization. A fresh outfit, ordered from England, had duly arrived, and was awaiting me, and two reliable Red river half-breeds were engaged for the journey.

Shortly before my departure, when everything was in readiness, I happened to be one of the unfortunate guests at the Manitoba hotel, which was completely destroyed by fire one night in the early part of February. I was fortunate enough, however, to save my instruments, cameras, rifles, guns, etc.—in fact, everything which was necessary for the trip, and only my clothes went up in smoke.

On February 26 a final start was made from Selkirk. Horses and sleigh were used as far as Berens river (about halfway up Lake Winnipeg), where my dogs and drivers met me. A few days' delay at Norway House, Oxford House, and a week at York Factory to rest my dogs, and I appeared once more on the scene at Churchill—the first week in April. The spring was luckily a very late one, so there was no immediate necessity for hurrying away from Churchill, which was the last place where supplies could be obtained. A short distance north from Churchill the barren land commences, and no fuel can be got. The weather continued very cold, the thermometer frequently registering from -10° to -15° Fahr. The Eskimo, or Husky, who had so faithfully promised to return and meet me, had as yet shown no signs of putting in an appearance. Five weeks were passed at Churchill, the monotony of the life being broken by the occasional arrival of Huskies with loads of venison. A few Chipewyan Indians turned up, relating miserable stories of starvation during the winter months. The Huskies brought welcome news about the deer (caribou), which were reported to be very numerous all along the coast. I may

here mention that the success of the whole journey, not my own particular one, but any expedition into the Barren North land, depends entirely on the presence of deer in sufficient numbers along the route.

The season had now arrived for us to move on, if we wished to have good ice to travel on as far as Chesterfield inlet. The Husky not having turned up, I engaged another Husky in his place—"Milook," who agreed to accompany me as far as I wished, and who was capable of acting as guide as far as Marble island. We left Churchill on May 12 with two sleighs, twelve dogs, and four men, including the writer, all told. I took the precaution to haul a canoe along—for in the event of the polar bears having demolished the one left in cache near Marble island—not an unlikely contingency—we should have been placed in a decidedly awkward situation, being unable to return on the ice, and having no craft in which to proceed by water. Several nights' dried meat were taken for ourselves and the dogs, by which time we hoped to be amongst the caribou, or deer, as they are more commonly styled. A large supply of tea and tobacco, and such articles for trading with the natives met with *en route*, as knives, files, beads, thimbles, needles, awls, etc., were included in our outfit. Supplies, such as flour, bacon, sugar, etc., were dispensed with altogether. We were to depend henceforth on our rifles, guns, and nets to supply us with food.

Marble island was reached on June 5, and here we found the canoe intact, just as it had been left the summer before, so the spare canoe was quickly broken up to supply some much-needed fuel. Travelling on the ice along the coast had on the whole been very good, and our progress, though slow, had been steady. Deer had been very scarce, and the dogs had starved several nights. The deer, which the Huskies had reported as being so plentiful a few days north of Churchill, had all moved away inland, and only their tracks remained when we passed.

Many times did I deplore the folly of leaving Churchill with such a small quantity of dried meat. At one time it looked very much like having to beat a retreat back to Churchill, hauling our stuff on hand-sleighs. Fortunately, a few deer were met with and killed, just in time to save us from such an ignominious course. I should hardly have dared to have shown my face back at Churchill, forced to turn back for a second time.

We had a great friend in the weather, which, with the exception of one blizzard, had been absolutely perfect—clear, bright, and cold. Those who know the climate of the Hudson bay may well be surprised. Such a long spell of glorious weather as we experienced the whole way up to Chesterfield inlet, and again up the inlet itself, has rarely been heard of before. As far as Marble island, the ice had not shown the slightest sign of breaking up, and the surface of it was as dry as in mid-winter. I thought several times of my two Cree lads from Oxford House. If they had been along now, it would not have been possible

for them to have turned tail. There was no retreat now, for by this time the rivers to the south would be breaking up. We were burning the bridges behind us, so to speak.

The entrance to Chesterfield inlet was reached on June 8. The ice was still good to travel on, though the sun's power was commencing to show its effect, and numerous pools of water which lay on the ice had to be avoided if possible, otherwise splashed through. The weather continued perfect. It was hardly possible to believe that we were on the Hudson bay, a worse climate than which it would be difficult to find. Deer were shot as we wanted them, though at times they were not so plentiful as might have been wished. Still, there was no starvation either for ourselves or the dogs. Hunting delayed us a great deal, but large supplies of provisions would have delayed us very much more. In fact, it would not have been possible to have hauled up a sufficient supply of "outside stuff," *i.e.* flour, pork, sugar, etc., to have lasted the trip. As it was, my own and every available dog at Churchill had been requisitioned for the two sleighs. Obtaining a supply of meat would sometimes cause a delay of three days. Failing to sight deer on the first day would necessitate a second day being spent in hunting, and a third day was then required for hauling the meat. I used to shoot six or seven animals at the same spot, if possible. These would last us three days, when another halt would have to be called for hunting. Geese, ducks, ptarmigan, and other spring arrivals in the shape of small birds, hawks, loons, gulls, etc., began to appear at this time.

What at one time, in fact the whole way up, had caused me no little anxiety—*viz.* starvation on Chesterfield inlet while waiting for open water—now seemed very remote. The head of Chesterfield inlet was reached on June 21. During the latter part of the way up, travelling on the ice had become very bad. At one place the ice was so rough and hummocky, that the dogs' feet were cut to pieces, and I almost despaired of getting any further on the ice. By retracing our steps a long way, we managed to travel along the shore on the rafted ice, and so avoid the worst of the hummocky ice, which, when once we passed, gave us no further trouble; the ice became smooth again, and remained so until the head of the inlet was reached.

The last few days we had to travel in water the whole time, which was from 1 foot to 2 feet and over in depth, as it lay in large pools and small lakes on the ice. On several occasions some of the smaller dogs were actually swimming, and still trying to haul. The ice on the inlet was still 3 to 4 feet thick, but the snow, except in patches, had all disappeared from the Barren Ground. At the head of the inlet, some of the Baker Lake Huskies were met with. They appeared to be in a very starving condition, deer in the vicinity being very scarce, and they were without nets of any kind.

On portage was made over to Arkok, which is the

Husky name for the deep bay of Baker lake which lies just to the south of Howell island and the outlet from Baker lake into Chesterfield inlet. The canoe was hauled over by the dogs on bare ground, but all the stuff had to be packed over on our backs, the Huskies lending a willing hand. Arkok, on Baker lake, was reached on June 27, and here we were delayed for several days waiting for open water. We were then able to launch the canoe and kyaks, and proceed along the narrow strip of water which had already opened between the ice and the shore. At Arkok our nets kept us well supplied with fresh-run salmon, which average in weight from three to ten pounds. Following the south shore of Baker lake, the mouth of the Kazan river was reached on July 12, and here another delay of five days was necessary, the ice ahead on the lake being compact and solid. I now wished to obtain a supply of dried meat to take along in case of emergency. Deer, although fairly plentiful, were very difficult to get near, owing to the plague of mosquitoes, which was now at its height. The animals never remained quiet for a single instant. I managed always to kill enough for our immediate use by some very long range shooting. The flesh of the deer at this time was far from being palatable, and it was hardly fit to eat, being streaked with blood and foam all through. The marrow—a former luxury—was now of the consistency of blood and water, the inevitable result of “fly-time,” the wretched beasts being kept on the dead run day and night.

Baker lake is some 60 miles in length east and west. The head of it was reached on July 19. More of the Baker lake Huskies were met with at the head of the lake, at a place called King-ak, which is a deep bay to the south of the river flowing into Baker lake from Schultz lake. These natives were delighted to see “kablunak,” or white people, again, and a present of tobacco completed their happiness. They willingly gave us assistance over the portage to the river, thus saving us going back a long distance and then round in order to reach the mouth of the river. Tracking the canoe and kyaks up the river for two days, Schultz lake was reached. Schultz lake and Aberdeen lake to the west of it are well known, and call for little notice. On Aberdeen lake, which is of considerable extent, we were delayed several days by head winds, and on one occasion were beset by ice, which even at this late date—July 31—had not all disappeared. However, by availing ourselves of every chance, and by travelling by night instead of by day, good progress was made. In the matter of light, the nights were now almost as clear as the days. Frequently I used to start to hunt deer at midnight.

At the head of Aberdeen lake deer were met with in large bands. They were now on their annual migration to the south. From now on, we never “hunted” deer—it was not necessary; they could have been shot with a pistol from the tent door; one could almost catch them. Fish—large trout, whitefish, a few salmon, arctic trout, and one or two other varieties—were taken by the nets in large quantities. In one night

a single short net took over 100 lbs. weight. This was indeed a land of plenty, flowing with fish, deer, and small game.

On August 3 the mouth of the Doobaunt river was reached and passed, and we entered the Ark-e-leenik river (the Thelewdezeth of Back), which flows in from the west and joins the Doobaunt river. Large quantities of driftwood were found on its banks, for this river (Ark-e-leenik) is well wooded further west. Hitherto we had depended on moss and small heaths to provide a fire for cooking purposes.

We had now entered the unexplored country. How far west the Ark-e-leenik river would take us, whether it was navigable or not for canoes, were problems which we had come to solve. There was no information to be obtained from the Eskimo, for none of them had ever ascended the river for any distance. So without guides and without supplies of any kind, we started into this unknown country, trusting to our rifles and nets to provide us with a living, and to the good fortune which up till now had come our way. The journey eventually turned out to be so absurdly easy, that I more than once regretted that it was so, for half the pleasure of exploration is derived from meeting and surmounting difficulties, *i.e.* providing, of course, they can be successfully surmounted without abandoning most of one's stuff on the way. The main Ark-e-Leenik river was explored for a distance of 182 miles, and the western branch of it was ascended for 117 miles. The divide between the waters of the Hudson bay and Great Slave lake and the Mackenzie river was crossed at an altitude of 1394 feet, a short distance beyond which we reached Clinton Colden lake, and our journey of exploration was safely accomplished. The Ark-e-Leenik is a fine large river about 300 yards wide, having an even steady current of from 4 to 5 miles an hour. For the entire distance of 182 miles which we followed the main river, there is not a sign of any rough water which could possibly be misinterpreted into the meaning of a rapid, and it is navigable for a steamer with considerable draught nearly the whole way. About 50 miles from its mouth, wood (spruce) of fair-size growth is to be found, and the woods then increase in size and extent until the river divides, the larger branch coming in from the south, the smaller—which we followed up—joining from the west. The western branch, which was ascended for a distance of 117 miles, has numerous small and some large lakes on its upper waters. This branch of the Ark-e-leenik, although not free from rapids and rough water, presented no difficulties worth mentioning; a few portages of a mile in length, one of 3 miles, and several smaller ones, and the large peculiar-shaped lake dotted in on most maps is reached.

We had long since left the limits of Huskyland, and were now (the upper waters of the western branch) well into the hunting-grounds of the Yellow Knives and Dog Ribs from Great Slave lake. Musk-ox were met with in large numbers on the main Ark-e-leenik river. There is a

stretch of country about 80 miles in extent into which no human being enters. The Eskimo do not hunt so far west; it is likewise too far distant for the Yellow Knives and Dog Ribs from Slave lake to enter. To penetrate this country in the dead of winter would be simply to court starvation. The deer have all departed, and to depend on finding musk-ox at the end of the journey would be risky indeed, for not enough meat could be hauled to see the party safely back through the barren and deserted country which would lay behind them. There still remains, I am happy to say, one spot in this Great Barren North land—which is sacred to the musk-ox—into which human beings dare not enter. Here the animals remain in their primeval state, their solitude undisturbed by the hated sound and sight of man. Long may they remain so. The musk-ox were quite tame, and exhibited no fear, only curiosity. I approached several herds within 30 yards, photographed them at my leisure, moving them round as I wished, and then retired, leaving them still stupidly staring at me in wonder and amazement. When deer were not procurable—and several times we seem to have run out of them altogether—a musk-ox was killed. Fish were plentiful all along the Ark-e-leenik; in fact, I never saw such a grand river for fish. The nets were rarely set, however, when meat was procurable, as it caused considerable delay in the morning, and the nets had to be dried. Moose are to be found on the main Ark-e-leenik, also black bears. On the western branch the woods decrease in size and extent as one ascends, until finally at the height of land there are none, and once more we had to fall back on moss and heaths for fuel. Deer were then very scarce, and the musk-ox we had long since left behind, but something always turned up to keep the pot boiling. One day it would be a wolverine, another time a fat wolf; all animals appear to be good on the Barren Lands, or is it that one's appetite is good? An occasional goose was shot, ducks, ptarmigan, an arctic hare; we always had enough, anyway, and one soon ceases to be particular as to exactly what kind of an animal it is which satisfies one's hunger.

We had the good luck to meet the Eskimo from the arctic coast on the Ark-e-leenik river, who resort to this river to obtain wood for their sleighs. These natives had never set eyes on a white man before, and had no articles of civilization whatever. They were all dressed in deer-skins, and armed with long bows, arrows, and spears, beaten out of native copper. The use of tobacco was quite unknown to them, and firearms they had only heard about. They gave me a good deal of information about their country and the copper deposits along the arctic coast, and I obtained from them several copper implements, such as dags, spear and arrow heads, needles, etc., which were all beaten out of native copper, giving them in exchange knives, files, and needles, which last appeared to have by far the most value in their eyes. They exhibited no signs of fear at our approach. They were a jovial lot, and

camped with us that night. In the evening they sang together, rather nicely, I thought. The next morning we parted, with many signs of friendship on their part.

On Clinton Colden lake, a very incorrect Dominion Government map in my possession was the cause of our going close on 100 miles out of our way. From Clinton Colden lake to Fond-du-lac on Great Slave lake, the geography of the country is well known, if not very accurately surveyed. On Artillery lake we struck the green spruce woods again about halfway down, and there we bade a final farewell to the Barren Northland, over which we had journeyed for well-nigh four months, and which had treated us so hospitably. The river flowing from the foot of Artillery lake into Great Slave lake is only passable for canoes the first 5 miles or so, beyond which distance the river descends torrent fashion through a deep precipitous chasm to Great Slave lake.

We had made several short portages on the unlucky day of the disastrous canoe accident, and already it was getting on for camping-time. In letting the canoe down a small side rapid by a bow-and-stern line, the stern line parted, and the tail of the canoe was quickly swung out into the current. In an instant it was caught by the rapids, and the bow line wrenched from the grasp of the man who held it. It all happened in a second. A cry of despair from one of my men, and we ran wildly down the river in the vain hope of the small craft being caught by some side eddy, and so brought close enough to the shore to get hold of. It shot the first rapid broadside on, even survived through the second without capsizing. A faint gleam of hope sprang up in my breast, but only for a second. A glance ahead down the river quickly dispelled any such hopes. The waters ahead, toward which the small canoe was being hurried, were all white, one broad expanse of seething foam, from which the tops of black rocks protruded in ominous fashion. The next time I lifted my eyes to look, the canoe was being tossed about, bottom up, amid one sea of foam, and the stuff, such of it as floated, was being swept away down to the rapids below in scattered directions. My heart sank; everything we possessed had disappeared—all gone! Rifles, guns, nets, axes, instruments, cameras, collections of geological and botanical specimens, note-books, and my precious photos, the result of a whole summer's work irretrievably lost! Even the canoe itself was soon lost sight of, and we were left with absolutely nothing but the clothes we stood in, still staring vacantly at the raging river which seemed to hold us with a certain fascination. My first impulse was to feel in my pockets for matches, and to my joy I discovered nine dry reliable wax matches, each one of which was good for a fire. This meant nine nights' fire, anyway. To cut a long story short, the canoe was eventually recovered, also a box, in which were my note-books and diaries containing the record of the journey, and a few other things. The loss of the geological and botanical collections,

on which I had spent much time and trouble, I particularly regret; the loss of an exceptionally interesting collection of photos I deplore.

By the loss of the rifles, guns, and nets, we were now without the means of procuring food, and were in the middle of a very rough country. Deer were plentiful, and stood stupidly staring at us within easy range; fish were leaping in the pools on the river, but the means of killing deer or taking fish were gone. Not an enviable situation in which to find one's self, and a very disastrous finish-up to an otherwise successful and most enjoyable journey. For six days we lived on what cranberries and blueberries we could find. We then fell in with the Yellow Knives, many of whom I knew. From them I obtained some dried meat, sufficient to take us to Fort Resolution on Great Slave lake, where we safely landed on September 25. At Resolution we heard all about the Great Slave Lake Mining bubble, which had finally burst, leaving many, I am afraid, richer in experience, if not in pocket. There still being a chance of reaching Athabasca Landing by open water, I availed myself of it, only remaining at Resolution a couple of days to get some very necessary clothes and footgear. A fresh start for the south was made on September 28, but we only reached as far as Red River post, 35 miles north from Fort McMurray, when the ice stopped us on October 17. The rest of the journey was accomplished with dogs.

APPENDIX.

GEOLOGICAL DATA.

June 5.—Rocks at Eskimo camp, near Marble island, large outcrop of dark green schists; fragments of white quartzite along the shore. North of this, for some distance, no rocks *in situ*; fragmentary rocks scattered around were gneiss of varied colour, mostly light grey, containing black and white mica in large quantities. These specimens were smoothed and rounded, and have evidently been transported.

June 8.—Small island off the coast, about 5 miles south of the entrance to Cape Inlet: rocks *in situ* grey gneiss, cut in different directions by veins of red or flesh-coloured granite, dipping east at a low angle. Wag island, composed of light grey gneiss and some darker coloured, containing hornblende horizontally lying, well smoothed and grooved by glacial action; no striae observed, but the ice moved over this part in a south-south-east direction; vegetation on island very scanty.

June 10.—Neck of land connecting Variety point with south shore of Cape Inlet: similar gneiss, horizontally bedded, cut by veins of granite; smoothed and grooved, but no striation. Hill to the south on mainland, similar formation; dip almost vertical. On the top of hill, an extensive heap of loose, smooth, and rounded boulders, and stones of gneiss (terminal moraine?).

June 12.—Large island in Cape Inlet, bearing west-south-west from Dangerous point: gneiss associated with red granite; in places huge blocks upheaved and thrown out of place by frost action; beds dipping west at an angle of 45°. Point 80 miles west of Dangerous point; coarse-grained gneiss with granite; dipping at angle of 40°. Other places in Cape Inlet have been noticed in Mr. Tyrrell's report.

June 26.—Arkok (a bay to the south of Bowell island): first signs of sandstone (red) formation, fragmentary only; no rock *in situ*.

June 27.—West point of Bowell island, between south outlet of Baker lake and

Arkok: large outcrop of sandstone; conglomerate; very little sandstone pure. The conglomerate contains quartzite pebbles, some very large, very hard to break with an axe; dipping south-west at various angles. Fragments and large slabs, some with ripple-marks of pure red sandstone lying around, and shales composed of sandstone *débris*. No other formation *in situ*, but scattered fragments and small boulders of gneiss chiefly.

June 30.—South shore of Baker lake, opposite Maur-en-ik-nak. Exposures appear a short distance inland, in the form of large oval-shaped mounds, which cap the small hills rising from the undulating grass-covered flats. Specimen 4, obtained close to camp from rock *in situ*, a schist, apparently, though the rock has rather the character of a fine or medium grained thin-bedded gneiss, of a dark grey or greenish colour, breaking easily when struck with an axe, with a slaty cleavage; the rock is cut by veins of white quartz, and blotched with same; surface of rock smoothed and rounded; dipping west-north-west at an angle of 50° . Another specimen, also numbered 4, from further inland: a small exposure, surface of rock much disintegrated by frost; no sandstone *in situ*, but abundant evidence of this formation existing in the vicinity, from the number of rounded stones lying around everywhere; the small circular gravel terraces, as seen everywhere on the Barren Land, much in evidence; broad and extensive low ridges, generally flat-topped, on which are piles or groups of stones; small beds and banks, and lying around on gravel surfaces between the numerous large and small lakes are shells innumerable.

July 3.—Took specimens of shells, which here, head of Arkok, form the sub-soil, or, rather, a bed of these shells, from $1\frac{1}{2}$ to 2 feet thick, underlies the thin layer of soil, which supports a growth of moss and grass. This bed of shells extends continuously for over a mile from the shore, perhaps further. For 6 miles distant they were still to be seen at the edge of and between small lakes—in fact, everywhere where the ground was not covered by a growth of moss and grass. They were observed at a height of about 100 feet from the lake. (Specimens of these shells and a few rock specimens will be sent out from Churchill.)

July 5.—From head of Arkok, west-north-west along Baker lake: more extensive oval or mound-shaped exposures of similar rock, which now assume the character of ridges descending abruptly to the shore; land beyond flat, with low shores, covered with sandstone *débris*. Sixteen miles west-north-west from head of Arkok, at the mouth of a small river: exposure of red or reddish-brown sandstone in bed of river, extending for 80 yards north and south, and about 25 yards east and west; beds $1\frac{1}{2}$ to $2\frac{1}{2}$ feet thick, dipping west at an angle of 8° . This exposure is 6 feet below the east bank of the river, is smooth and striated, striae trending south. One mile further on, small mound or oval-shaped outcrop of red sandstone close to the shore, surface much affected by weather.

July 9.—Proceeding along south shore of Baker lake, numerous exposures of red sandstone along the shore. At 9 miles there is an extensive area about half a mile long by 250 yards wide, covered by a throw of smallish flat angular-shaped pieces of sandstone, which lie in the form of regular layers, or steps, as they slope towards the shore. Surely these parts could never have been swept over by fields of ice? A curious rocky exposure of red sandstone close by, the jagged surfaces of the beds projecting perpendicularly. Difficult to ascertain the dip, but the beds facing north are perpendicularly broken off. A short distance further on, sandstone beds dip south-west at an angle of 42° . Two miles inland mound-shaped sandstone hills; with the exception of these, land is dead flat, with numerous lakes scattered around.

July 11.—Along south shore of Baker lake to mouth of Kazau river: no rocks *in situ*; sandstone boulders and *débris* abundant.

July 12 and 14.—East side of mouth of Kazau river: no exposures; loose

boulders, gravel, dirt; shores sandy. Several miles to the south Kazan river cuts through a range of hills. Did not have opportunity of visiting them.

July 15.—West side of mouth of Kazan river: land extending from shore for 2 miles inland, dead, flat, and dotted with small lakes innumerable; then rising to a height which gives it the appearance of a long low ridge, as viewed from away east; sandstone beds here showing. Wherever sandstone formation exists, the land flat or slightly undulating, and grass-covered.

July 16.—Ascended rising land in form of a ridge, which lies to south-west of the mouth of Kazan river, which has an altitude of from 300 to 400 feet above the level of the lake. Exposure of sandstone on summit of ridge, which has the appearance of a rather altered rock. Dip difficult to determine; all that could be seen were small pieces of rock projecting perpendicularly. Surface of the main bed which showed was smoothed and rounded; terraces, semicircular or rim-shaped, at summit of ridge, composed of angular and irregular shaped fragments of sandstone, some of it differing from that *in situ*.

July 21.—On the portage between King-ak (which is a deep bay to the south of the mouth of river flowing from Schultz into Baker lake) and Koo-ook (which is the name of the river itself), which we struck 2 miles up from its mouth, we passed over several low ridges, all felspathic granite, cut by veins and associated with quartz; beds horizontally lying. Distance across portage, 5 miles.

July 22.—Travelled 14 miles up Koo-ook. Granitic formation; this granite in some places contain hornblende, in others it is of a felspathic character, the felspar occasionally being very much in the ascendant. Ridges, which run parallel to river on the south side and about one mile distant, all similar, cut by narrow veins, and associated with white quartz, occasionally in large quantities. Exposures numerous; beds mostly horizontally placed; smoothed and grooved. North-east side of river not examined, but more rocky than south-west side.

July 23.—Proceeding up Koo-ook. Scattered fragments along the shore, giving evidence of a new formation in the vicinity, which we struck after travelling $\frac{1}{2}$ miles—a greenish or grey-coloured schist, having a very slaty cleavage. Large exposures along ridges south-west of the river; general dip of beds nearly vertical. A short distance further on, this rock is cut by a vein of white quartz 10 feet thick, and in many places by smaller veins. At 13 miles the river cuts through this rock to a depth of 80 feet; the rock on south side is deeply grooved by glacial action. A short distance inland, large slabs have been uplifted from the matrix by the action of frost, and are left sticking up, resembling large slabs of slate upended.

July 24.—Went on 7 miles up Koo-ook. Rocks similar schists, at one place dipping south-east at an angle of 60° .

July 25.—Reached the rapids near east end of Schultz lake after travelling 2 miles. Just above the rapid, granitic formation again. Similar, although varying slightly in character, to the rocks on King-ak portage. One outcrop appeared to be a granitoid gneiss. Extensive exposures on both sides of river. Dip of beds at one place north 25° W. at an angle of 40° . East end of Schultz lake, granitoid gneiss; 10 miles up the lake on north side, and a short distance inland, exposure of very coarse-grained red or brown sandstone. On the top of these beds, and also near by, rested some huge circular chunks of conglomerate, in which were embedded large quartzite pebbles, some of them the size of a man's head.

July 26.—Delayed by heavy head winds; took a walk back from camp, *i.e.* north-east. Rocks, conglomerate predominating, containing usual quartzite pebbles. A few exposures of red-brown, very coarse-grained, quartzitic sandstone.

July 31.—East end of Aberdeen lake. Rocks *in situ*; conglomerate and sandstone, thick and horizontally bedded. Proceeding along north shore as far as

Kek-ek-tellig, white sandstone *débris*. (Kek-ek-tellig, by the way, is where the Doobaunt river enters Aberdeen lake.)

August 3.—Between Kek-ek-tellig and mouth of Doobaunt river. Boulders on the shore very varied, granitic predominating; also some of gneiss, greenstone, angular quartzite, conglomerate, sandstone, etc.

August 5.—No rocks *in situ* until to-day at noon, when we were 33 miles up the Ark-e-leenik (Thelew) river: outcrop of fine-grained, purply coloured sandstone, dipping north 15° E. at an angle of 30° in bed of river; surface of rock much jagged and broken. It occurs on north-east side of river, and is of considerable extent; the high-cut banks, between which the river flows, are of sand and loam; outcrops of rock on hills some distance away to the south-east, probably sandstone.

August 11.—No rock *in situ* until to-day. We have been passing through a very flat and occasionally undulating country, without not even a small hill in sight. It is evidently sandstone all through. Red and white sandstone *débris* scattered along both shores. Exposure of white sandstone, very thin and horizontally bedded, in the bed and on both sides of river, extending for about 200 yards (this would be about 94 miles up the Ark-e-leenik river).

August 12.—Camp about 120 miles up the Ark-e-leenik, 2 miles above our camp of last night. Horizontally and thick-bedded red sandstone, well shown in precipitously cut bank on west side of river, and similar exposures were seen at a dozen or more different places passed to-day. Some of these cut banks exposed the sandstone beds to the depth of 50 feet; they occur on both sides of the river. Stratification well shown in many of them. Near camp of last night, outcrop on the top of a small longish, low hill, east of river, appeared white—probably white sandstone, but possibly limestone; small fragments of the latter noticed on the small circular terraces not far distant. Did not have an opportunity to visit the hill. Twelve miles up the river from camp, many large loose boulders piled up by the ice on east side of river; some of them beautiful specimens of granite, others of gneiss; greenstone noticed. But the large majority of the boulders were of a kind of hardened shale, surfaces of which were a dullish white and resembled limestone on the outside; in form they were mostly angular, but the edges were smoothed and rounded.

August 13.—Continuing up the river, we passed on the east side of the river an exposure of thin-bedded, horizontally placed red sandstone, deeply and distinctly scored, striae south-east; parts of the surfaces bore ripple-markings.

August 16.—About 170 miles up the Ark-e-leenik river, approaching a range of hills of moderate height, which it entered through a short gorge after we had travelled 4 miles. An almost precipitous hill, about 600 feet in height, confines the river on the left-hand side at this spot, the lower part of which is one confused mass of large, loose white sandstone fragments, which have fallen and slipped from above, where the rock is *in situ*, horizontally bedded. A spur or ridge from this hill or peak extends up the river for some distance, and is of the same formation. Character of country beyond gorge extremely sandy, the sand being beautifully white. About 7 miles beyond the gorge the Ark-e-leenik river divides, the larger branch cutting its way through thick beds of horizontally lying, red and white, chiefly white, sandstone, and flows off in a south-east direction, the smaller branch, which I followed, taking a south and changing course. I shall refer to this now as the west branch of the Ark-e-leenik. A hill lying to the west between the gorge and the forks, a typically glaciated sandstone hill.

August 17.—We now ascended the main Ark-e-leenik river for a distance of 182 miles. Proceeding up the western branch, white sandstone formation very evident, river cutting its way through thick beds at several places. At 3 miles from the forks a fall of 5 feet, white sandstone beds horizontally placed exposed;

half a mile beyond, a fine fall of 30 feet; horizontal beds of white sandstone cut precipitously for a distance of 150 yards. Rock appears to be very soft, and easily crumbles; surface on east or north side of fall, near the edge, well smoothed and very distinctly striated, striae S. 20° E.

August 18.—At last we come on a change from the everlasting sandstone, which formation continues the whole way up the Ark-e-leenik river. At about 12 miles the western branch cuts through a thick bed of gabbro (?), which extends in the form of a deepish gorge for 200 yards; this rock is very massive, beds dipping south at an angle of 60°. Rock varies in character, some of it having the appearance of a foliated rock on the outside. Quartz very much in the ascendant in some cases; biolite in others. In places the rock is largely composed of a flesh-coloured stuff, with only a thin layer of the matrix rock appearing. A dark green rock is much in evidence in many cases. Twenty feet or more of this formation is cut through by the river at this spot. Half a mile beyond, the confounded white sandstone appears again; I thought that we had seen the last of it. Huge chunks are piled around in a confused mass in a small gorge, the rock itself also being seen *in situ*.

August 19.—A very short distance beyond this small gorge, the river flows through a deep gorge 40 to 100 feet deep. At the commencement of this gorge, and extending for a distance of 500 yards, the beds cut through are now the familiar white and reddish sandstones containing quartzite pebbles, mostly small; same rock on both sides of the river. On the north-east side beds are thin and horizontal; on the south-west side beds are thick and falsely bedded. Beyond this sandstone, which extends up 500 yards, the formation changes; Laurentian gneiss appears. The junction of the two formations is not very distinct, for a small landslide has taken place at this spot, but the difference in the colour of the soil is very apparent; the white sandy soil of the sandstone and the reddish purple of the new formation lie side by side; the gneiss extends up the gorge for a mile, and above it again crops out, extending also up small side gulches which adjoin the river. This rock has a very distinct foliation on the outside, more so than when broken. Breaks with a slaty cleavage. It is much broken up, up-ended, and generally jumbled about in the gorge, but dips east at a very high angle, almost vertical. Width of river at this point, 860 feet. Loose rocks of gneiss scattered around for 2 miles beyond the gorge.

August 20.—Travelled 12 miles up the river. Gneiss crops out all along in bed of river and at several other places, varying in character in different places.

August 21.—Proceeded up river to small lake. Rocks here, red granite (fels-pathic); very rocky country. Took a long walk in afternoon; rocks all the same—red granite *in situ*, and scattered boulders and fragments. Gneiss does not appear *in situ*, but boulders and fragments of it, irregular, angular, and sharp-edged; plentiful.

August 22.—Fourteen and a half miles up river. Land very flat and sandy, some high sand hills and knolls in view. At 5 miles, beds of red granite are cut by a thick vein of white quartz, in which nothing is visible. Vein running north and south (true) in form of a small ridge 70 yards by 15 yards. This was on south side of river. One and a half mile further up, outcrop of dark grey rock; very brittle, and splits up into small sections when tapped with the axe. Outcrop in bed of a small stream, coming in from the south; exposure about 40 yards in extent, dipping S. 30° E. at an angle of 60°. At 12 miles river cuts through a bed of Laurentian or granitoid gneiss, mostly grey in colour, but some reddish; horizontally bedded, smoothed, but not striated. Noticed several small outcrops of this rock yesterday and this morning, but the chief formation is the red granite. The curious balanced stones observed to-day for the first time.

August 25.—Travelled 6 miles. Barren land here terribly rocky—miles of loose rocks and boulders; red granite and granitoid gneiss. But I had little time to geologize, for I had to hunt up the blessed river, which we had lost in a lake.

August 28.—Camp at small lake leading into Kasba lake. Small outcrop of mica schist; a smooth low rock, full of small water-holes, sloping gently to water's edge; other rocks same as before, chiefly granite.

August 29.—South side of the divide (a short distance east of Clinto Colden lake). Quartzitic grey granite, dipping south-east at an angle of 75° ; red granite, also in evidence a short distance east. Last sight of Laurentian gneiss, but it may be present. Had but little time to look around, as I was busy portaging.

August 31.—Fine-grained basalt(?) diorite(?) obtained from a highish rocky island, north-east end of Clinton Colden lake, rock sloping south-east to water's edge, smoothed and striated, striae south-south-east; island 7 miles west from east end of lake.

September 1.—North-west end of Clinton Colden lake. Rocks, grey granite; a great deal of it; country very rocky.

September 2.—Went up strait between Aylmer and Clinton Colden lakes; coarse-grained biotite, quartzitic grey granite. Biotite occurs in small chunks, and the rock is very full of it in smaller pieces. Rocks much displaced, and a rough country. Some of the granite is red, in which felspar is very much in evidence.

September 3.—Along the south shore of Clinton Colden lake. Huge fragmentary rocks; where the rock is *in situ* it is smooth (waterworn) and slopes to the water's edge; no striation or grooves. The rock appears to have a certain foliation, and is associated with quartz in places; this rock, which I failed to classify, and the grey biotite granite are the distinctive rocks along the shore passed to-day. At two places the rock dips north at a high and low angle.

September 5.—Six miles south of narrows leading from Clinton Colden lake, similar rock to that on the King-ak portage (July 21)—pink feldspathic granite. Rock sloping to water's edge; no definite dip and no stria, but smoothed.

September 6.—River between Clinton Colden lake and Artillery lake, grey and feldspathic granite occurs along the banks. In places the country is of a very sandy nature.

September 7.—Twenty-two miles south from head of Artillery lake, and on the west side. This rock (specimens have been lost, of course) occurs all along the west shore to our present camp, which is 36 miles from the head of the lake, the grey and feldspathic granite only occasionally appearing. I called it an altered limestone(?) There are large outcrops of it all along; quartz being much in evidence in veins, pebbles, and small chunks. On the outside of the rock the quartz appears in queer-shaped excrescences, which run along in the form of ridges, giving the rock a banded appearance. The matrix is brown on the outside, grey inside; very hard. Amber-coloured quartz crystals in the form of hexagonal pyramids, also milk-white ditto, were very common, and some beautiful specimens were taken. The rock itself reminded me of the boulders found on the Ark-e-leenik river (August 12). These boulders appeared to be composed of a hardened shale, and were a dullish white on the outside, and this rock has a brown appearance on the outside, but to the eye they appeared to be of the same composition. At the foot of the Artillery lake, at the outlet, there is a vein of discoloured quartz containing large quantities of iron. I have a specimen of this; the rocks were granitic again, and this was the last place where any notice was taken of the rocks, for our trouble then commenced.

Slave lake has by this time been fully reported on. Sandstone occurs on some of the islands near Fond-du-lac.

In the foregoing notes, on the days which are missed, it must be supposed that the formation of the previous day or days continued, or else that no rocks were met with. There were no fossils to be found in the sandstone, although I searched diligently for them at several places.

METEOROLOGICAL DATA.

Date	Bar.			Ther.	Remarks.	Date	Bar.			Ther.	Remarks.
	6 a.m.	6 p.m.	Min.				6 a.m.	6 p.m.	Min.		
May						July					
12	—	30.08	11	—	Left Churchill.	12	29.70	29.68	—	—	Wind S., fine.
13	30.10	30.21	13	—	Cold and cloudy, wind N.W.	13	29.70	29.68	40	75	Wind S.S.W. Mouth of Kazan river.
14	30.28	30.30	1	—	Wind N.	14	29.75	29.87	42	—	Wind N.N.W., rain in morning. Mouth of Kazan river.
15	30.23	30.13	6	—	Warm day, wind W.	15	30.03	29.92	39	58	Wind N.N.W.
16	30.04	30.10	16	—	Wind S.E.	16	29.88	29.85	42	72	Still at mouth of Kazan river.
17	30.12	30.13	0	—	Wind S.	17	30.00	30.04	34	68	Wind N.W., fine.
18	30.13	30.00	5	—	20 miles south of Eskimo point.	18	30.00	29.90	35	73	No wind, very hot.
19	30.03	30.08	10	—	Cool and cloudy, wind S.	19	29.78	29.63	42	—	Wind E. Started west from Kazan river.
20	30.13	30.11	15	—	Inland from Eskimo point.	20	29.58	29.62	42	—	Wind N.E., thick mist. West end Baker lake.
21	30.11	29.88	18	—	Eskimo point 9. A blizzard.	21	29.72	29.76	—	64	Fine. West end of Baker lake.
22	29.48	29.89	27	—	" gentle breeze N.W.	22	29.80	29.60	37	—	Wind W.
23	30.00	29.96	4	—	" wind N.E., thick and snowing.	23	29.61	29.60	45	—	Rain in evening.
24	29.81	29.73	18	—	" wind N.W., blowing and drifting.	24	29.70	29.41	38	—	Wind N.W.; rain last night. East end of Schultz lake.
25	29.78	29.86	18	—	"	25	29.37	29.43	46	—	Heavy rain-storm in morning from S.E.
26	29.98	29.95	12	—	Left Eskimo point. Wind S.E., mild and cloudy.	26	29.47	29.30	30	—	Wind W., light.
27	29.94	29.95	12	—	Wind S.E., dull and cloudy.	27	29.13	29.25	43	52	Rain.
28	29.87	29.90	26	—	Wind N. and N.E., cool and cloudy.	28	29.30	29.13	33	58	Wind N.W. West end of Schultz lake.
29	29.86	29.87	28	—	Wind N.W., dull and cloudy.	29	29.18	29.12	34	51	Wind W.N.W. East end of Aberdeen lake.
30	29.88	29.95	25	—	Wind N.W., thawing in afternoon.	30	29.15	29.16	35	59	Strong N.W. and W.N.W. winds the last few days.
June						Aug.					
1	30.04	30.08	22	65	Wind W., warm and sunny.	1	29.20	29.30	29	54	Strong W.N.W. On Aberdeen lake.
2	30.02	30.00	18	—	Wind N.W., bitterly cold. Term point.	2	29.45	29.36	38	56	Strong N.W.E. West end Aberdeen lake.
3	29.92	29.90	20	—	Wind S.E., fine. Left Term point.	3	29.30	29.33	43	—	Commenced ascent of Ark e-leenik river (Thelew dereth of Back).
4	29.89	29.92	24	—	Misty in morning, clear in afternoon.	4	29.46	29.64	39	58	Wind N.E., light; very fine.
5	29.98	30.17	15	—	Wind S.E.E., warm and hazy on Marble island.	5	29.70	29.72	27	—	Wind N.E., light. Ascending.
6	30.20	30.04	28	63	Wind S., fine and calm, snow fast melting.	6	29.73	29.65	44	—	Ark e-leenik.
7	29.96	29.80	28	—	Wind S.W. Left Marble lake, arrived Baker's foreland.	7	29.60	29.48	40	—	Travelling west towards Great Slave lake.
8	29.72	29.70	33	—	Wind N.W., gentle breeze; 16 miles south of inlet.	8	29.50	29.43	39	—	Wind N.E.
9	29.67	29.65	33	—	Wind W., hot and bright. Wag island.	9	29.44	29.43	47	63	Wind N.E., showery.
10	29.68	29.74	34	—	No wind, perfect day. Variety point.	10	29.47	29.45	45	—	Fine.
11	29.68	29.63	24	73 (in sun)	Gentle S. breeze.	11	29.43	29.36	41	53	Fine.
12	29.56	29.67	33	—	Wind S.W., dull and cloudy. Left Variety point.	12	29.30	29.23	37	—	Fine.
13	29.80	29.85	22	—	Near Dangerous point.	13	29.20	29.16	37	—	Fine.
14	29.78	29.62	28	—	Wind S.W., strong, fine day, south-west of Dangerous point.	14	29.21	29.20	37	—	Fine.
15	29.50	29.53	24	58	Rain, heavy shower in afternoon.	15	29.23	29.08	36	—	Fine.
16	29.64	29.64	32	50	Wind W., dull; clear in evening.	16	28.93	28.87	48	—	Altitude 777 feet.
17	29.64	29.72	30	56	Skiff of snow in morning, near North river, Cape inlet.	17	28.88	28.80	49	—	Travelling west and ascending.
18	29.73	29.69	24	—	Wind W.; fine near Stony point.	18	28.78	28.70	—	—	High wind, heavy rain.
19	29.60	29.60	31	—	Wind S.W., fine, gentle breeze.	19	28.82	28.08	40	—	Rain in morning.
20	29.64	29.73	33	—	Wind N.W., fine. Near mouth of Quioch river.	20	29.20	28.81	30	—	Altitude 1364 feet. The divide.
21	29.76	29.70	32	63	Variable light airs, fine. Bowell island.	21	28.66	28.76	32	—	Skiff of snow.
22	29.72	29.75	32	—	Wind N.W.; rain last night.	22	28.46	28.28	28	—	Wind N.W.
23	30.07	30.04	38	—	No wind, fine. Baker lake.	23	28.30	28.17	24	—	N.E. wind.
24	30.02	30.09	34	63	Wind S.E., strong. Baker lake.	24	28.27	28.29	31	—	Dull and showery in morning. East end Clinton Colden lake.
25	30.13	30.12	35	—	Wind S.E., gentle.	25	28.34	28.30	32	—	W N.W. wind. Still on Clinton Colden lake.
26	30.15	30.13	29	—	Wind S., strong; weather fine.	26	28.25	28.23	34	—	
27	29.98	29.67	30	—	Wind S., moderate.	27	28.20	28.12	29	—	
28	29.51	29.43	36	63		28	28.19	28.36	31	—	
July						29	28.37	28.37	34	—	
1	29.57	29.58	28	—	Wind N.W., strong, cloudy; still at east end of Baker lake.	30	28.48	28.43	33	43	
2	29.60	29.62	36	59	Wind N.W., strong.	Sept.					
3	29.62	29.64	36	58	Wind N.W., dull and cloudy.	1	28.55	28.62	28	—	
4	29.63	29.73	36	53		2	28.68	28.62	32	—	Travelling west on Clinton Colden lake.
5	29.88	29.90	37	65		3	28.56	28.38	35	47	Straight between Clinton Colden and Aylmer lakes.
6	29.96	29.78	38	72	Wind S.E., hot; sunny in morning, overcast in evening.	4	28.37	28.30	30	—	Returning south and east on Clinton Colden lake.
7	29.67	29.70	42	62	Wind N.W.; rain last night.	5	28.60	28.04	28	54	
8	29.67	29.51	33	—	Wind S.E., strong. Left east end Baker lake.	6	28.16	28.32	31	—	Wind N.W. East end of Clinton Colden lake.
9	29.68	29.70	32	53	Wind N.W.; heavy rain last night.	7	28.36	28.42	29	—	Between Clinton Colden and Artillery lakes.
10	29.61	29.69	33	—	Travelling west towards Kazan river.	8	28.32	28.20	33	—	Altitude 1252 feet. On Artillery lake.
11	29.79	29.75	37	60	Wind S.S.W.	9	28.06	28.27	36	42	N.E. Moderate gale.
						10	28.13	27.97	34	43	S.S.E. heavy wind.
						11	Accident happened.				
						12	{ Thought we saw smoke. Went to look. Tried to swim; built raft and got canoe. Proceeded down river, which we shortly afterwards had to leave.				
						13					

A JOURNEY FROM LAKE NAIVASHA TO THE VICTORIA NYANZA.*

By Captain G. H. GORGES, of the Uganda Rifles.

LEAVING Naivasha station on the morning of November 26, 1899, with a caravan numbering in all eighty-eight, two marches brought us to the west of Lake Naivasha. We skirted the southern shore, over grass downs and through occasional clumps of mimosa, passing many small volcanic peaks and ridges, whose slopes are covered with volcanic dust, obsidian, and lava rock. On the third day we ascended the wooded heights which form the first step of the Mau escarpment, continuing our way across an open grass valley and up the escarpment to the borders of the forest—a climb of nearly 3000 feet from the lake. This country on the eastern slopes of the escarpment, between the lake and the forest, is at certain periods of the year, usually in the rainy season, inhabited by the Masai, the grass in the valleys and on the hillsides affording good grazing for their cattle, sheep, and goats.

On the fourth day (November 29) we entered the forest, and I confess to having felt a little anxious for the comfort of the caravan, as previous accounts of attempted journeys through this somewhat difficult country were not very encouraging. However, after three days' hard work, we successfully accomplished this part of the journey. Scarcity of water through the forest was the only real discomfort we experienced, and had we not had the good fortune to meet a small party of Wandorobo in pursuit of game, who for a small present led the caravan to a water-hole, I believe we should have been forced to retrace our footsteps and endeavour to find another route, for after leaving the water-hole on the following morning, water was not again found until we had marched for eleven hours. The forest here is not more than 30 miles broad from east to west. Further to the north it widens considerably, and in some parts is not less than 70 to 80 miles across. The only inhabitants of this forest region are a few Wandorobo, who dwell in small grass huts, which they hurriedly construct where they can conveniently get water, and sometimes near to where a herd of elephant happens to be feeding. They live entirely by the chase, are very timid, and most of them, on the approach of the caravan, fled into the undergrowth. There are many gigantic trees in the forest, the largest being juniper and cedar; we saw several specimens of beautiful tree orchids, ferns, including mailenhair, and bracken, and various kinds of wild flowers and creepers.

On December 1 the caravan emerged from the forest into a large tract of open country—undulating grass spurs, intersected by deep

* Forwarded by the Foreign Office. Map, p. 140.

wooded ravines and valleys. On leaving the forest, I observed that the country to the west was thickly wooded. To the north was dense forest, and to the south and south-west for many miles rolling downs, in parts thinly wooded. I therefore decided, for the present, to take a south-westerly route, thereby avoiding to a great extent the more difficult wooded country. The result was satisfactory, for we continued our journey across nearly 70 miles of country without meeting with any serious obstacle to hinder our march. This large tract of open country, bounded on the east and north by the forest, on the west by thickly wooded heights, on the south by the Dogolani desert, and on the south-west by two ranges of mountains, named respectively Subugu Loitoi and Subugu Erok (*vide* map), is well watered by the Gwaso Nyiro and its tributaries, the chief of which are the Gwaso Na Erok, Gwaso Samvei, and Gwaso Nuso. The Nyiro drains the southern flanks or slopes of the great Mau escarpment, and the general direction of its course after receiving its tributaries is due south. It flows through the Dogolani desert, and finally empties itself into a salt lake, some miles to the south in German territory.

This open country above described was once inhabited by the Masai, of whose kraals we found many traces near the rivers. It is a magnificent grazing country, but I am told by some of the older Masai of Naivasha that, owing to the incessant raiding and lifting of their cattle by the Masai from German territory on the south and the Sotik on the west, the survivors fled with their cattle and took refuge near the shores of lakes Naivasha and Elmenteita some ten years ago, placing between them and their enemies the Mau escarpment and the forest. The soil consists chiefly of a kind of red sandstone, varying in hardness, and in places greatly worn by the action of water. The river banks and beds are rocky, whereas the soil of the ridges and plains is quite sandy. Near the rivers are large patches of "scrub" jungle, very difficult to penetrate, and in which one is very apt to lose one's bearings.

On December 7, taking a north-westerly direction, we again entered a forest, or rather crossed a succession of thickly wooded heights, which form a barrier from 10 to 15 miles broad between the basin of the Nyiro on the east and the cultivated region, comprising the countries of Sotik and southern Lumbwa on the west. On December 9 we entered the country of Sotik. The inhabitants were at first suspicious, but happily we continued our journey to the shores of Victoria Nyanza unmolested, and without the slightest trouble with the natives, encamping on December 14 on the banks of the river Kimsonoi, which forms the boundary between Sotik and Lumbwa, and on December 17, 18, and 19 we travelled through south and south-west Lumbwa.

On leaving the Lumbwa country we again found ourselves in an uninhabited region—a large tableland, about 20 miles across, covered with high grass and thinly wooded, dividing Lumbwa from the district of the

Kach, a small tribe inhabiting the shores of Lake Victoria on the south-east of Ugowe gulf. Here we encamped on December 20, after a journey of approximately 220 miles from Naivasha station.

I travelled by almost identically the same route on the return journey for the following reasons:—

1. It was desirable to establish thoroughly friendly relations with the inhabitants of Lumbwa and Sotik.

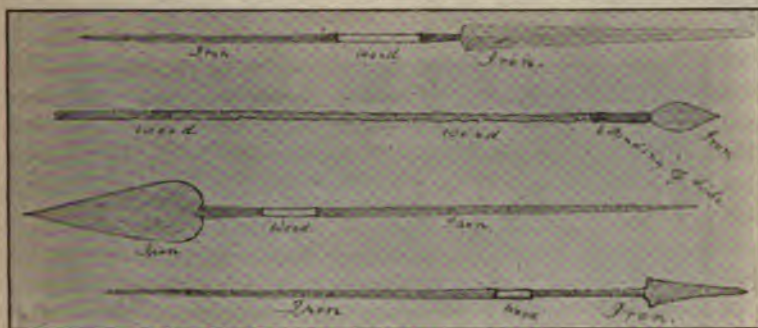
2. The Kosova, a somewhat powerful and war-like tribe inhabiting the peninsula between Ugowe gulf and Kavirondo bay, south of the Sondo river, through whose country it would be necessary to travel in order to explore the shores of the lake near the German boundary, were unfriendly, and as I was anxious to avoid conflict with them, I deemed it advisable not to attempt to force my way through their country, lest my escort should not prove strong enough to resist their attacks. I therefore very reluctantly had to abandon any attempt to discover what the Germans are doing on the lake.

3. Food for the caravan had to be procured for the return journey, and as the Lumbwa appeared to have plenty of grain stored in their villages, I decided to endeavour to establish a market in their country for the purchase of supplies for the caravan to Naivasha.

The return journey from the lake-shore to Naivasha was accomplished in eighteen days, *i.e.* in seven less than the outward journey. This was due to the fact that on the outward journey we had to find our water, and proceed with caution and slowly through the inhabited districts, whereas on the return journey we knew our road, how to deal with the natives, and where to find water. The following notes respecting the districts visited may be of interest.

SOTIK.—This country lies about 100 miles from and almost due west of Naivasha station, and is bounded on the east and south by thickly wooded heights and dense forest, on the north and north-west by Lumbwa, and on the south-west by Kosova. Sotik is a small district, thinly populated, inhabited by a peaceful and independent tribe, whose attitude was on the whole most friendly. In bearing the men are not unlike the Masai, but are not to be compared with them in physique or good looks. They are well proportioned, muscular, and of medium height. Many of the older men are very treacherous looking; some even have a villainous cast of countenance. I should say they are like the Wa Kikayu in this respect—treacherous, though I confess I saw no attempt at any act of treachery on their part towards me or my men, but imagine that they refrained from any attempt at ambushes, or from molesting the caravan in any way, simply because they saw we were too strong, and that every precaution, both day and night, was taken to guard against surprises. They are armed with spears of all shapes and sizes, and many of the older men carry bows and arrows of indifferent make. They all carry a most formidable weapon, in the

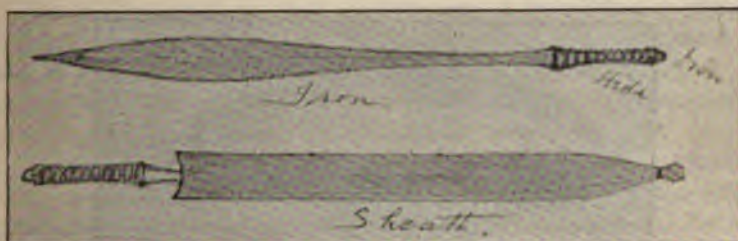
shape of a long-bladed, double-edged knife, sharp as a razor, with a small leather handle, in a well-made wooden sheath bound with hide, which is worn on the right side and secured to the waist by a narrow belt made of gut and beautifully worked with different-coloured beads. Most of these knives are from 30 to 40 inches in length. They likewise



SOTIK SPEARS.

carry shields of cowhide, similar to the Masai shield, but not so well made.

The younger men and boys wear a small piece of cloth over the shoulders saturated with fat and dirt, the elders being more comfortably clad in goatskins. Some of the head-dresses are most picturesque;



SOTIK KNIVES.

enormous busbies made of monkey-skins or of quantities of black fowls' feathers fixed into a leather cap which fits tightly to the head, giving to the wearer a very warrior-like appearance. The method of circumcision adopted is a simpler one than that of the Masai. It mainly consists in removing the foreskin with a piece of red-hot iron, the effects of cauterization being ample to check any severe bleeding.

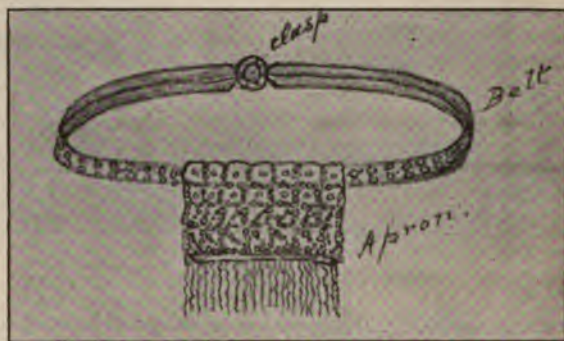
The women are of small stature, well proportioned and graceful, but, on the whole, not good looking. Most of the young girls are naked; a few wear a small apron made of leather, prettily ornamented with white beads, extending from the umbilicus to just above the knees, and

fastened round the waist by a beautifully worked narrow belt made of leather, cowries, and beads. The older women wear large skins of cow-hide from the shoulders to the ankles. All are extremely partial to ornaments, and especially fond of cowries, Elkuta, white beads, iron chain, and brass wire. They are most respectfully and well treated by their men. The operation upon women differs in no way from that practised by the Masai.



SOTIK HEAD-DRESSES.

The physical appearance of the ears (both of men and women) is most extraordinary, the whole of the pinna of the ear being perforated and disfigured by ornaments of all sizes, of wood, iron chain, brass, ivory, and copper and iron wire. The strange habit of extracting the lower



SOTIK GIRL'S APRON.

central incisors, so common among the local tribes of this country, also prevails among them, the explanation being, that when any of them become temporarily unconscious or seized with convulsive fits, they can be fed through this aperture.

The country is very hilly, well watered by three fair-sized rivers (each with tributaries), named respectively the Amala, Nyongores, and Kimsonoi, the last named, as already stated, forming the boundary

between Sotik and Lumbwa. It flows in a south-westerly direction into the Sondo river, which enters into the Victoria Nyanza to the south of Ugowe gulf. The Amala and Nyongores take a southerly course through the forest to the south of Sotik, but where they eventually discharge their waters I cannot at present state, but believe they join with other streams, and finally bend to the west to Lake Victoria in German territory.

The hillsides are dotted with patches of cultivation, and the valleys are mostly thickly wooded. The soil of the country is of a rich black loam and red marl, and is highly fertile. Every kind of vegetable, native and English, could, I feel certain, be successfully cultivated; the natives, however, grow only wimbi,* not to any extent, but just enough to satisfy their own wants. Mtama† is grown in very small quantity, also a few beans and pumpkins, and some tobacco. Bees are largely cultivated, and the honey is of excellent quality. Chickens and eggs are procurable.

There is a great deal of good pasture land in this country, where small herds of sheep and goats and a few cattle graze. There are also many thousand acres of uncultivated waste land, overgrown in parts with thick impenetrable scrub, at an altitude of from 5600 to 6000 feet. The climate is extremely healthy and mild at this time of the year, but I believe that in the rainy season, which commences about February and ends in May, living here would be somewhat uncomfortable for Europeans.

The natives dwell in small beehive-shaped huts lying in groups of three and four on the sheltered hillsides, surrounded in most cases by a small thorn *boma*, in which they also herd their cattle at night. The huts are well thatched with grass and reeds, and are ornamented at the top with an earthen vessel.

The people of Sotik recognize a chief, the name of the present man being Loloisuru; but from what I saw during my visit to the country, I don't think he exercises much authority over his subjects. There are also a number of petty chiefs, or rather headmen of groups of villages. I had many interviews with the chief and most of the headmen, and explained to them that I had been sent by Her Majesty's special commissioner for the express purpose of establishing friendly relations with them and the people. They told me that few white men had ever visited their country; that some years ago a large caravan led by three Europeans had passed rapidly through further to the north into Kavirondo. These were evidently Pringle, Austin, and Sergeant Thomas of the Macdonald Survey Expedition. They said that, not knowing why so large an armed force was moving amongst them, their Elmoran were

* A kind of *pennisetum* grain.

† *Holcus sorghum*.

continually on the alert. Since then no white man has visited the country, but a few Swahili caravans trading in ivory have passed through from German territory to Kavirondo at long intervals.

I made presents to the chief and all the headmen, and in return received a few sheep and goats, which were badly wanted for the caravan. I think I made them understand their position, viz. that the country, though their own, is under the protection of the British Government, and that every white man and trader must be granted a



SOTIK HUT.

free passage through the country without being molested, whether armed or not.

LUMBWA lies to the north and north-west of Sotik, and resembles it in many respects. The country is not so hilly, and is very bare of trees. It is far more extensively cultivated and more thickly populated.

The Lumbwa are a finer race than the Sotik, both men and women being of better physique and better looking in every respect. They proved to be very friendly, though on first entering their country after crossing the Kimsonoi river, they assembled in large numbers and held a "shauri" to discuss whether or not they should demand from me a present before permitting me to proceed with my caravan. I observed an unusually large gathering of Elmoran, and took every precaution to

guard against a rupture. I then, on learning the nature of their discussion, sent for the chiefs and informed them that they could at once go and tell the people that they must banish from their minds any idea of demanding anything from a Government officer; that, on the contrary, it was their business, if presents were to be exchanged, to make one to me first. The result of this communication was that, after a few hours, sheep and goats were brought to the *boma*. I then told them that I wanted nothing from them, bought the sheep, and presented the chiefs and headmen with various kinds of trade goods. The large gathering of Elmoran broke up, and friendly relations were established. Supplies of every description, including flour, beans, honey, tobacco, fowls, eggs, sheep, and goats were brought daily to the *boma*, and we were never once molested.

The same customs prevail amongst these people as among the Sotik. The dress of men and women is the same. The men carry the same weapons of offence and defence; but the spears are better made, and the large leaf-bladed spear is carried by most of the young fighting men. The Lumbwa are undoubtedly a more prosperous and in every respect a better tribe than the Sotik. Their country is well watered by three rivers, the Kimsonoi, Kintoi, and Tuyawe all flowing in a south-westerly direction into the Sondo, which last drains both Lumbwa and Kosova, and flows into the lake opposite two small islands on the south of Ugowe gulf. The soil of the country differs in no way from that of Sotik, being rich and fertile. A great quantity of wimbi is grown, but there are also in this country large tracts of uncultivated land. The altitude varies from 4500 to 5000 feet. The climate is healthy, very hot during the day, and excessively cold at night. I should imagine, however, that in the rainy season this country would not be so healthy, there being so many swamps in the valleys which intersect the bare hills.

The name of the chief of the part of Lumbwa through which I travelled is Singari. He appears to be a reliable man, and has great influence over his people and headmen, the discipline amongst the fighting men being very marked. The people were most respectful, and friendly with my Swahilis—so much so, that when the caravan was marching through the country, the women insisted on several occasions on carrying the porters' loads, a practice which had to be stopped, owing to the very slow progress made.

KACH.—This is a small tribe inhabiting the low-lying country on the south-east shores of Ugowe gulf. They possess herds of cattle and flocks of sheep and goats, but do not cultivate the soil. They dwell in large fortified villages, surrounded by walls built of stone and mud, the reason for this being that they are continually raided by the Kosova from the south and the people of South Kavirondo from the north. Each village consists of from fifty to sixty beehive-shaped huts, packed closely

together within the circular wall, while the live stock is herded in a paddock in the centre at night. The following rough sketch will give some idea of one of these villages:—



A KACH VILLAGE.

Of splendid physique, the Kach are savage, and carry spears, bows, and arrows; but they are too small a tribe to do any harm, and it was for this reason, and owing to the fact that they knew that unfriendly relations would probably mean the confiscation of their cattle, that they were friendly with us. Both men and women are naked.

The Lumbwa called these people Kach, but they called themselves Kachwachi; but I am inclined to think that Kach is the name of the tribe, and that Wachi must mean people or tribe, though I could not say for certain, being ignorant of their language. The climate of this country is exceedingly hot and unhealthy, as it is low-lying and swampy, and a large belt of papyrus runs out from the shore into the lake for more than a mile.

KOSOVA.—I saw very little of this tribe. The Lumbwa, Sotik, and Kach are frightened of them, being constantly raided by large parties of Kosova warriors, who carry off their cattle and women. In fact, the Sotik appear to me to be utterly cowed by this more powerful tribe. I was earnestly requested by all the friendly natives to go and recapture for them some of their stolen cattle, which they prize far more than their women. I however refrained from any such business, and assured them that the present state of affairs would be duly reported to Her Majesty's Special Commissioner, with a view to some steps being taken to ensure their living at peace with and in good-will towards their

neighbours in the future. My intention was to traverse Kosova to the lake, and if possible visit the German post on the boundary; but I could see from the beginning that these people determined not to permit me to travel through their country in peace, and, not wishing to act in any way contrary to my instructions, I, as before stated, unwillingly left them alone. I feel convinced, however, that with a stronger escort, say in all fifty rifles, I could establish thoroughly friendly relations with this tribe without in any way resorting to armed conflict. I trust that on some future occasion I may be able to visit these people. They are undoubtedly brave and warlike, and largely cultivate the soil.

GAME.—Almost every description of game was seen on the journey. The country drained by the Gwaso Nyiro is a splendid feeding-ground, and consequently the home of game. Elephant, rhinoceros, giraffe, buffalo, zebra, eland, wildebeest, mpalla, Coke's hartebeest, *Grantii*, and *Thomsonii*, various bush-buck, wart-hog, and ostrich feed here unmolested, except during the occasional hunting expeditions of the Wandorobo in these parts. The belt of uninhabited country between Lumbwa and Kach also contains many varieties. We shot elephant, Jackson's hartebeest, the Topi hartebeest, water-buck, reed-buck, and wart-hog. The rivers of Lumbwa are full of hippo, and at the request of the natives we shot two or three, which brought the whole country-side to the scene. They made short work of the meat, eating it raw, and covering themselves with the fat. It took them less than an hour to cut up and devour three enormous hippo. Four elephants were bagged under somewhat peculiar circumstances. On December 22, during the return journey, the caravan was marching peacefully along the high ground between Kach and Lumbwa, when suddenly a large herd of elephant appeared on our right flank. This was the signal for a general stampede of the porters; loads were dropped, and the men rushed into the bush in all directions, some of the elephants actually running over the loads. The herd had evidently been frightened by a large grass fire in the valley of the Sondo, and were tracking across country when they suddenly came on the caravan. In self-defence I and Sergeant Myles shot at them and bagged four, the tusks of which have been handed in to the Government store at Naivasha as revenue, with the exception of one pair, which Sergeant Myles has been permitted to keep as a trophy, pending the wishes of Her Majesty's Special Commissioner and Commander-in-chief in the matter.

FISH.—Several were caught in the Nyiro and in its tributary the Na Erok. One kind was particularly good eating, somewhat like the perch, but smaller, seven or eight going to the pound. Another was a mud-fish, and by no means good eating. The Nyiro and Na Erok were the only two rivers containing fish.

BIRDS.—I regret I am unable to describe the many varieties of

beautiful birds I saw. A splendid collection could be easily made in this country.

RIVERS.—Most of the rivers in the wet season would be most difficult to cross, and some impassable. We were very fortunate in travelling through the country at an unusually dry season; had it been otherwise, the journey could not possibly have been accomplished under two and a half to three months.

The river Sondo, after receiving its tributary, has, for a distance of 50 miles before its mouth, an average width of 60 to 70 yards. It flows over huge boulders, and has a very rocky bed. Though fordable at present in places, it could not possibly be crossed at any point in the



NATIVE BRIDGE

wet season. The smaller rivers could be bridged, the average width of the Nyiro, Amala, Nyongores, Kintoi, and Kimsonoi being not more than 30 to 40 feet, and in places their banks are steep, and therefore adapted to rough bridging. The natives have constructed a few suspension bridges of peculiar fashion by utilizing the strong branches of trees which overhang the river-bed. The long thin poles which span the river are bound together with bark, and strong crooked poles support the bridge in the centre. The accompanying sketch gives a rough idea of how these bridges are made.

GEOLOGY.—The rocks are chiefly volcanic—obsidian, lava, etc., with some sandstone. On some of the hills in Sotik and Lumbwa there is a kind of white marble rock. As regards gold-bearing rock, in the hills near the lake-shore, between Lumbwa and Kach, I found what I thought might contain gold, and after washing it carefully, what looks to me very much like gold-dust is seen at the bottom of the pan. I have forwarded a specimen to the Ravine for inspection.

SUPPLIES.—Plentiful, especially flour. A caravan of a hundred men

could be well supplied all the year round by the Lumbwa and Sotik without causing any drain on the country, and of course, if a Government station was built, food in abundance would be procurable, as the natives would cultivate larger areas. Indeed, with little labour, a *boma* could be made self-supporting. I have in my mind's eye a few excellent sites for a Government station, on high ground, in close proximity to clear running hill streams, where the ground in the vicinity could be easily cultivated, and would yield English vegetables of every description, and where there is abundance of firewood and stone for building purposes.

HEALTH OF CARAVAN.—Not a single man was incapacitated from work throughout the journey; a few cases of mild fever and coughs occurred during the crossing and recrossing of the escarpment, and the passage through the forest, owing to the severe cold, accompanied by incessant and heavy rain.

CONDUCT.—The behaviour of the men, both escort and porters, was excellent, and it was chiefly owing to this that we made such good friends with the natives.

RESULTS OF JOURNEY.—1. Thoroughly friendly relations were established with the Sotik, Lumbwa, and Kach.

2. A fairly easy route was found from Naivasha to the food-producing countries. With a small amount of labour, the road could be considerably improved, and the journey from Naivasha to Sotik performed in nine days (including one day's halt).

3. Although the Kosova were unfriendly, the result of coming into contact with them is not unsatisfactory, for on a future visit I feel confident I could go through their country by forming a *dépôt* in Lumbwa, and by taking a slightly stronger escort.

4. It is satisfactory to know what a really well-watered country this is, both in the inhabited and uninhabited parts, and that there are supplies all the year round. Of course this route loses any importance it might have had, owing to the advance of the Uganda railway, but were it not for the fact that a railway is in course of construction to the north of Ugowe gulf, this new route would be shorter than the present one to Port Ugowe—for porters.

In conclusion, I would like to say a few words in praise of my British non-commissioned officer, Sergeant J. Myles, who ably assisted me in every detail connected with the discipline and comfort of the caravan. Throughout he proved himself to be a hard-working, zealous, and capable non-commissioned officer, thoroughly trustworthy and reliable when thrown on his own resources.

ADMIRALTY SURVEYS DURING THE YEAR 1899.

UNDER the orders of the Lords Commissioners of the Admiralty, eight of Her Majesty's vessels, with three small hired steam-vessels, manned by 78 officers and 639 men, have been employed on hydrographical surveys on the home and foreign stations. A naval officer, assisted by officers of the Royal Indian Marine, has also been employed, with the sanction of the Admiralty, under the Indian Government.

The following is a brief summary of the work accomplished, as detailed in the report prepared for presentation to Parliament:—

The number of newly discovered rocks still increases; reports of 274 rocks and shoals, which were dangerous to navigation, have been received at the Hydrographic Department, and were notified to the public by Notices to Mariners; 1223 miles of coast have been charted, and an area of 4654 miles has been sounded.

On the east coast of Scotland:—The survey of Cromarty and Inverness firths was completed.

On the west coast, close surveys were made of Loch Broom, Portree harbour, Loch Ewe, and Loch Ryan.

On the east coast of England:—Observations were made to ascertain the set of the tidal streams at several positions on the east coast, and the following surveys were carried out:—

The portion of the Humber between Barrow haven to the westward and Skitter Ness and Saltend to the eastward.

This survey reveals the fact that considerable decrease in the depths, notably in the neighbourhood of Hull Middle Sand, has taken place since the year 1894; as this shoaling is unaccompanied by any general deepening of the channel, it may have a somewhat serious aspect in connection with the future navigability of the Humber about Hull.

The Shingles patch in the Duke of Edinburgh channel was resounded. It was found that the shoaling of this obstruction still continues.

Other work was done at Harwich, Goole, and in the Orwell.

On the west coast of England:—Morecambe bay was resurveyed. A survey of the approach to Barrow-in-Furness was begun, and a portion of the entrance to Peel harbour was sounded.

The examination of the shoals off the Scilly islands, 108 in all, was also completed.

St. Heliers, Jersey, was examined, and a plan was made of St. Peter's port, Guernsey.

On the south coast of England:—The recently dredged areas at Plymouth on the Vanguard and Rubble banks were examined, and the Vanguard was reported clear for navigation.

A survey of Dartmouth harbour was begun, and a portion of the soundings in the outer approaches was obtained.

On foreign and colonial shores:—In Newfoundland the survey of White bay was continued, and plans were made of Bedeque harbour, the anchorage at North Sydney, Seal arm, Little harbour deep, Fourché and Hooping harbours.

On the west coast of Africa:—The survey of the river at Sierra Leone, begun last year, was finished, and a large plan was made of the anchorage at Freetown. Forcados bar was surveyed; it is one of the many entrances to the Niger, and has been the deepest for some years, but has not been charted since it attained its present depth.

A survey of the Congo river was made from Boma to Bull island, a distance of 36 miles; astronomical positions were obtained as far as Matadi, the furthest navigable point; and a plan was also made of Banana creek at its entrance.

A series of observations was made to ascertain the movements of the under-currents near the mouth of the river; the results have been published by the Admiralty.

On the west coast of North America:—The survey of Nanaimo, begun last year, was completed.

The first narrows of Burrard inlet were resounded, and a survey of Discovery passage was begun.

Deep-sea soundings and serial temperatures were obtained from Vancouver towards Australia for a distance of 2880 miles, thus completing a survey of the proposed route of the Pacific cable. This cruise occupied four months.

Magnetic observations were obtained at Honolulu.

In the Red Sea:—For the purpose of reporting, at the request of the Turkish Government, on the best system of placing aids to navigation, a plan was made of Kamaran bay, which is the quarantine station for Suez, and much frequented at certain times.

A prolonged but unsuccessful search was again made for the "Akbar" rock, a danger reported in the fairway of the Massawa channel. This search occupied three months of the *Stork's* time, the importance of verification or disproval being considerable.

In the Mediterranean sea:—At Nauplia the head of gulf was resurveyed.

In China:—The survey of Tinghai and its approaches was completed.

The main portion of Samsa inlet was surveyed, including the anchorage of Santu.

Observations were obtained of the currents and tidal streams at West Volcano island, Gutzlaff island, and in Vernon pass. It is hoped that these observations may tend to prevent the accidents which from time to time occur from want of knowledge of the tidal streams in this portion of the inshore route to the Yangtse Kiang, which is much used by small steamers in the north-east monsoon.

In Australia, on the west coast:—A good chart was made of Mary Anne passage and its approaches, and a plan of Onslow roads; both surveys disclosed many new shoals dangerous to navigation. Mary Anne passage was found to be narrower than formerly reported.

Strathmore rock was looked for without success; the examination showing the extreme improbability of its existence, it has been removed from the charts.

A series of soundings was obtained off shore from Cape Naturaliste to King George's sound, a distance of 270 miles. The 100-fathom line is defined throughout, and it was found that in the approach to Cape Leeuwin the contour of the bottom will afford great aid to navigation; to the eastward of King George's sound this is not the case.

A line of deep-sea soundings and serial temperatures was obtained from King George's sound to Tasmania.

In Queensland:—The survey was resumed inside the barrier reefs northwards of Cooktown and completed from Aye reef to 2 miles east of Dhu reef; the coast-line and off-shore soundings were obtained between Claremont point and a position 2 miles south of Cliff island, and a detailed survey made of Flinders group and its vicinity.

A plan was also made of Cairns harbour, which place is increasing in importance. Magnetic observations were obtained at Cairns and Townsville.

A dangerous 24-foot rock was found directly on the "course recommended"

half a mile north of Cape Flinders; also five other shoals lying near enough to the usual track to make their discovery of considerable importance.

In Tasmania:—A triangulation of Port Davey and Bathurst harbour on the west coast was completed.

In India:—The survey of the North Andaman island from Temple sound to Flat point was completed.

The astronomical position of the Andaman islands was verified by meridian distances. The western entrance to Andaman middle strait was surveyed.

Flat rock and Invisible bank were carefully examined, but no fresh dangers to navigation were discovered.

The survey of the west coast of Hindustan from Honovar to Mangalore was in progress at the end of the year.

During 1899 the Hydrographic Department has published 86 charts and plans, also 36 current charts; 33 plates have been improved by the addition of 41 new plans; 239 plates have been largely improved by additions and corrections; 4795 corrections have been made to plates by the engraver; 31,440 charts have received minor corrections at the hands of the draughtsmen.

The number of charts printed for the Royal Navy, for Government Departments, and to meet the demands of the general public has, during 1899, amounted to 451,088.

OBSERVATIONS ON THE AURORA AUSTRALIS.

By HENRYK ARCTOWSKI.

THE phenomena of the aurora australis are still very imperfectly known, as few systematic observations of the kind required have been made in the southern hemisphere. Dr. W. Boller,* in his catalogue of the appearances of the aurora australis recorded during more than 250 years (1640–1895), takes account of 1582 observations, corresponding to 791 different auroras. Most of these, however, have been described in a very imperfect manner. We are glad to be able to add something to the study of this phenomenon by the series of observations carried out on board the *Belgica* during the first winter ever passed in the antarctic regions.

We were throughout the winter at a considerable distance from the south magnetic pole, as the ship was caught in the ice on March 7, 1898, in $70^{\circ} 27' S.$ and $85^{\circ} 44' W.$ The constant movement of the ice, also, continually changed our position of observation; the extreme positions reached by the ship during the period when the aurora could be observed (March 11 to September 10) were $69^{\circ} 52' S.$ and $71^{\circ} 36' S.$ for latitude, and $82^{\circ} 35' W.$ and $92^{\circ} 21' W.$ for longitude. The observations were thus scattered over a region occupying about 10° of longitude and $2\frac{1}{2}^{\circ}$ of latitude. During our drift in the ice the atmospheric conditions were very unfavourable for observing the aurora, the amount of cloud being great.

The following figures show for each month the number of days with clear sky for several consecutive hours, *i.e.* with a maximum amount of cloud of 0 to 3 during part of the day:—

March.	April.	May.	June.	July.	August.	September.	Total.
15	14	8	16	22	15	14	104

After the end of September, the twilight in 70° or $71^{\circ} S.$ is bright enough to conceal any appearance of the aurora. Despite all the disadvantageous conditions, we were

* W. Boller, "Das Südlicht," *Beiträge zur Geophysik*, iii. 56–130, 550–608.

able to observe the aurora sixty-one times during the winter of 1898; and on March 12, 1899, two days before escaping from the ice, it appeared again, so that the total number of appearances noted was sixty-two.

Our observations allowed us to establish the diurnal period of the aurora, for the phenomenon usually appeared between 7 p.m. and 2 a.m., and its maximum of intensity was most often reached between 9 and 10 p.m. It is obviously impossible to deduce the annual period from one year's observations; still, the accompanying table shows clearly enough that the maximum of frequency falls outside the months of the antarctic night, and that the intensity is distinctly greater at the equinoxes. In March and the beginning of April we observed fine displays of variable aspects, but in July, on the contrary, the auroras which were seen took the form merely of a luminous glow; later, in September, the auroras became once more very active and comparatively bright.

A remarkable circumstance brought out by these observations is the predominance of a homogeneous arc, which remained visible, almost without change, for many hours and always in the same quarter of the heavens. The arc usually reached to 8° or 12° above the horizon, and its extremities were nearly 45° distant from the bearing of the culminating point, which was always south-south-west. At the winter solstice the arc did not attain so great an altitude as at the equinoxes. It thus appeared that during the polar night the auroral phenomena withdrew towards a region nearer the magnetic pole.

TABLE OF AURORÆ AUSTRALIS OBSERVED ON BOARD THE "BELGICA" DURING THE WINTER OF 1898.

	March.	April.	May.	June.	July.	August.	September.
1	—	—	—	—	—	L.	—
2	—	—	—	—	—	—	Ad. S. R. V. P.
3	—	L.	A. V.	—	—	—	—
4	—	—	—	—	—	—	—
5	—	—	—	—	—	—	A.
6	—	Ad. R.	—	—	—	—	—
7	—	—	—	—	—	—	—
8	—	—	—	—	L.	—	L.
9	—	—	—	—	L.	—	S. A. R. Ad.
10	—	A. S. Ad.	—	A.	L.	—	R. S. A. Ad.
11	A.	L.	—	—	L.	—	—
12	A.	—	—	—	L.	—	—
13	—	L.	—	S. A. F.	L. A. S. O.	—	—
14	A. P. W. C.	A. S. O. V. R. P.	—	L.	—	—	—
15	—	A. S. Ad. R.	—	L.	L.	—	—
16	—	—	L.	—	—	L.	—
17	—	—	—	—	L.	—	—
18	—	—	—	—	—	L.	—
19	Am. V. P.	—	—	—	—	Ad. S.	—
20	A. R. V.	—	A. S.	—	—	L.	—
21	—	L.	L.	—	L. S. A.	—	—
22	—	L. A.	L.	A. S. R.	A. S.	—	—
23	L.	—	—	L. S.	A.	—	—
24	L.	L.	—	S. Ad.	L.	—	—
25	A. S.	S. A. R.	—	—	—	—	—
26	S. L. R. V. O.	—	—	—	—	A.	—
27	—	—	—	—	—	A.	—
28	L.	L.	—	—	—	—	—
29	A. S.	—	Ad.	—	—	—	—
30	—	—	—	—	—	—	—
31	A.	—	—	—	—	—	—

Explanation of Signs employed.

A = Homogeneous arc.	O = Obscure rays.
Ad = Double arc.	P = Streamers.
Am = Multiple arc.	R = Rays.
C = Crown.	S = Dark segment.
F = Flames.	V = Wavy ribbons.
L = Luminous glow.	W = Curtain.

It would be very interesting to know whether the familiar phenomena of the aurora borealis are repeated in every particular by the aurora australis. One might inquire whether there is a perfect similarity between the phenomena in the two hemispheres; if their distribution in regard to the poles is analogous; if the periods are the same, and if they coincide; and, finally, one might ask if the two phenomena are simultaneous. As yet we cannot reply with certainty to any of these questions. In order to identify the aurora borealis with the aurora australis, it would be necessary to make several series of observations at corresponding geographical points in the two hemispheres. It seems to me that the problem of the polar auroras can never be fully solved unless Weyprecht's idea of international co-operation for scientific research in the polar regions is taken up anew and extended this time to both the frozen areas of the globe.*

Yet, for the present, I may put forward the remarkable analogy between the aurora borealis as observed by Nordenskiöld on board the *Vega*, and the aurora australis as we were able to observe it on the *Belgica*. The *Vega* was imprisoned in the ice during the winter of 1878-79 in $67^{\circ} 5' N.$ and $186^{\circ} 37' E.$ The auroras observed during this wintering furnished Nordenskiöld with the data which served to establish his theory of the aurora borealis.† The year 1878 was a year of auroral minimum,‡ and 1898 was also very nearly a minimum year; moreover, the distance of Kolyuchin bay, the winter quarters of the *Vega*, from the north magnetic pole is nearly the same as that of the *Belgica* (about $71^{\circ} S.$, $86^{\circ} W.$) from the south magnetic pole.§

It is remarkable that the aurora australis, as we observed it, presented exactly the same characteristics as the aurora borealis observed by Nordenskiöld on the *Vega*; his descriptions apply with literal exactness to the phenomena which we saw, and which will soon be described in the 'Scientific Results of the Belgian Antarctic Expedition.' The homogeneous arc with its dark segment is characteristic of both stations, and in the south, as in the north, it remained unchanged for hours. I therefore believe that our results compared with Nordenskiöld's will furnish the first elements of identification of the auroral phenomena of the two hemispheres, and that the theoretical considerations arrived at by Nordenskiöld for the arctic regions will be found to apply to the antarctic also.

* H. Arctowski, "The Problem of Antarctic Exploration," 'British Association Report,' Dover, 1899.

† 'Die Wissenschaftlichen Ergebnisse der Vega-Expedition,' Band i. pp. 226-272.

‡ Hermann Fritz, 'Das Polarlicht,' p. 117.

§ Position of the south magnetic pole according to V. von Haardt's map, $73^{\circ} 38' S.$, $146^{\circ} 15' E.$

BARON TOLL ON NEW SIBERIA AND THE CIRCUMPOLAR TERTIARY FLORA.*

By P. KROPOTKIN.

THIS new paper of the well-known arctic explorer is of exceptional interest. After a few historical remarks relative to the exploration of arctic Siberia, Baron Toll briefly sketches the geology of the Verkhoyansk ridge and the plateau in the west of it. The ridge, in the upper course of the Yara, Dulgulakh, and Bytantai rivers, consists of black slates, of Devonian age, and sandstones—partly glauconite sandstones—belonging to the Mesozoic age, and specially to the so-called "Volga deposits." Both are considerably metamorphosed. In the upper and the middle courses of these rivers, Triassic slates (containing *Pseudomonotis ochotica*, Keyserling) prevail. They alternate with sandstones, and were traced up to 70° N. lat. Between Verkhoyansk (67° 32' N.) and the junction of the Adicha with the Yana, Bunge found slates containing the *Gryphaea cf. dilatata*, which indicates the Liassic age of these slates. Liassic deposits were also found in 1893 on the Anábar.

Under 70° N., the Yana pierces the Kullar branch of the Verkhoyansk ridge, which branch shoots east-north-east, and consists of lower Triassic slates (*Hungarites triformis*, Mojs., and *Mecoceras affine*, Mojs.). Quartz porphyries pierce the Triassic slates, and granites constitute isolated heights, such as the Yngnakh-kaya mountain (4297 feet) and the Kikhilyakh (3528 feet).

The Lena, from Bulun to its delta, flows in a valley between the Verkhoyansk ridge and the plateau which lies to the west of this ridge. Middle carboniferous limestones were found on the right bank of the Lena, opposite Stolbovyi island; and Upper Devonian slates, similar to the Dulgulakh slates, were found on the bank under 67° N. Palæozoic limestones appear at Kumaksurki, and are covered further down by limestones and slates, containing beds of coal. Lower Triassic slates were found on the Tas-ary island.

As to the plateau, which is watered by the Vilui, Olenek, and Anábar rivers, and probably also by the Khatanga, it stretches as far as the Yenisei, reaching the lowlands of West Siberia. Baron Toll gives it the name of "Central Siberian plateau," instead of which it would, perhaps, be better to retain the name of "High Plains of Siberia," proposed by the present writer, reserving the names of plateaus for the high plateaus of East Asia.

The average altitude of these "high plains" is about 1000 feet, and they are mainly composed of Cambrian and Silurian deposits. A little above Yakutsk the Cambrian deposits are followed by carboniferous sandstones of the "Volga deposits." These deposits appear also along the Lena up to 71° N., and westwards to the mouth of the Olenek, where they cover Triassic deposits. The "Czekanowski ridge," running west-north-west and west along the coast, is composed of them. As to the "Pronchisheff ridge," which runs further, from the Olenek to the Anabar, it consists exclusively of Mesozoic deposits—Lias, Volgian, Neocomian, and Oxford. The names of Czekanowski and Pronchisheff, which Baron Toll gives to these two ridges, are sure to be gladly accepted by geographers. At one spot at the mouth of the Chirima (64° N.), Tertiary deposits, of which more will be said presently, were found by Czekanowski.

* "Sketch of the Geology of the New Siberian Islands, and the Main Problems in the Exploration of Arctic Regions," by Baron E. Toll, with two maps (*Memoirs of the St. Petersburg Academy of Sciences*, 8th Series, vol. lx., 1899. Russian).

The New Siberian islands occupy, as is known, the space from 73° to $76^{\circ} 6'$ N. and 136° to 160° E. long. The most northern and highest island is Kotelnai. Its northern portions consist of Upper Silurian limestones, rich in corals. Similar deposits are known on the continent, especially on the upper Olenek. On Kotelnai they form a series of folds running north-north-west, and Toll proposes for them the name of "Schmidt's ridge," thus rendering a well-deserved homage to the geologist and explorer of Siberia, Friedrich Schmidt. The southern part of the same island consists of Middle Devonian limestones and slates. At Bear cape Triassic deposits were found.* Diabases pierce the former, and olivine rocks shoot as dykes through the latter. The highest summit, Malakatyn-tas, 1200 feet high, consists of trapp. The New Siberia island, in the part explored by Toll, does not reach more than from 200 to 300 feet above the sea. The so-called "wood mountains" proved to be an excellent cutting through Miocene deposits, containing brown coal, and not deposits of modern driftwood. To the ridge formed by these Tertiary deposits Toll gives the name of "Hedenstrom's ridge." Only post-Tertiary deposits were found during a cursory visit to Fadeevski island.

The triangular shape of the great Lyakhovski island is due to granites (Bunge), while the Svyatoi Nos mountains on the mainland are either table-shaped or conical-shaped hills, made up of basalts. The Suruk-tas has well retained its volcanic form. These basalts are posterior to the Jurassic epoch. The glacial formations are represented on the southern coast of the Great Lyakhovski island by a lower bed, about 70 feet high, of ice, and an upper bed of clayey fresh-water deposits, always frozen, and containing tusks and pieces of the skin of the mammoth, as well as full frozen carcasses of *Ovibos* and rhinoceros. Remains of horses, stags (the noble American stag), antelopes, *saigas*, and even of a tiger, were found in this bed. To prove that these animals lived and fed on the spot, a complete tree of *Alnus fruticosa*, 90 feet long, with all its roots, leaves, and fruits, was found. Similar deposits, as is known, are spread on the mainland. Speaking of the conditions of life of these animals we must remember, however—Toll remarks—the musk oxen of Greenland and the mammals of the high plateaus of Tibet.

Omitting a few remarks of Baron Toll concerning the structural origin of the ridges of the far north of Siberia, we shall dwell especially on what he has to say on the exploration of the Tertiary deposits *still further north, towards the pole*. Beds containing brown coal, and probably of the same age as those of the New Siberian islands, were found, as is known, by De Long on Bennett island. Besides, volcanic rocks were seen on this same island, and when Baron Toll sighted Sannikoff's Land from Kotelnai island in 1886, he saw table-shaped mountains, the shape of which makes one believe that they must also have a volcanic origin, and that in the north of New Siberia there may be an archipelago, perhaps as big as that of Franz Josef Land. "Considering the geographical distribution of the Miocene plants in the arctic regions," Baron Toll writes, "we see that they appear in the shape of a complete ring around the pole, especially in Kung Karl's Land, on Spitsbergen, on the west and east coasts of Greenland, in Grinnell's Land, in Bank's Land, in Sitka, in Alaska, in Kamchatka, and finally on the Lena, at Kirimy-Phaya, in 67° N. The most northern spot where Miocene plants were found is $81^{\circ} 45'$, in Grinnell's Land. Captain Feilden, in 1876, during the British polar expedition, found there in the slates thirty species of plants, of which I shall only mention *Taxodium distichum*, or the marsh cypress, which now grows in the southern states of North America, a modern species of the pitch tree, and two fir trees; then the *Ulmus*

* List of fossils found are given in each case.

Corcalis, a lime tree, two birch trees, two species of poplar, and so on. The yearly average temperature under which such a flora could grow must have been at least 46°·5 Fahr., while now the average temperature of this spot is only 6° below the Fahrenheit zero. How can we explain such a change of climate, and altogether the possibility of climatic conditions necessary for such a flora?

"Two probable hypotheses," Baron Toll continues, "were offered to explain the facts. One explains them by a different distribution of land and water, and the other by a change of position of the axis of rotation of the Earth, and consequently of the two poles and the equator. The renowned astronomer Schiaparelli has discussed the possibility of the latter hypothesis, and his conclusion was as follows: 'Astronomy does not deny the possibility of those considerable changes of latitudes which are claimed by geologists for the explanation of certain geographical facts.' Among the geologists, the late Dr. Neumayr expressed himself as follows: 'Let us imagine that the north pole has shifted, in the Ferro meridian, ten degrees in the direction of North-East Asia. The 70° of latitude would run then through Spitsbergen, Novaya Zemlya, the mouth of the Ob, and thence through Siberia to Irkutsk; it would pass then through the northern portion of the sea of Okhotsk and Kamchatka, cross the Pacific in the south of Behring strait, entering America at the mouth of the Copper river, and reach Greenland at the spot where the 78th degree of latitude issues now.' Nathorst, in 1888, accepting this idea, admitted that the pole must have been during the Tertiary period full 20° southward of its present position. Under this supposition, the Tertiary plants discovered by Czekanowski on the Lena at Pirimy-khaya, under 70° N. lat., would have been under the 78th degree of north latitude, and the small leaflets of a sickly aspect which he found would have been explained by the proximity of the spot to the pole. But how would this suggestion agree with our own finds in New Siberia? Perfectly well-developed and full-sized leaves of *Populus arctica* and *Populus Richardsoni*, Hr.; numerous fruits of the mammoth tree (*Sequoia Langsdorffii*, Brogt.); the leaves of several conifers (*Taxites tenuifolius*, Schm., *Taxodium distichum miocenium*, Heer), and so on, do not indicate at all a proximity to the pole, while under Neumayr's hypothesis this spot would be situated under 85° N. lat., and it would be near to this same degree of latitude under Nathorst's hypothesis. Consequently, then, the hypotheses are fully insufficient, and we must have more data than those which I could collect in 1886—not only from that spot, but also from the islands situated further north. As to the other rival hypothesis concerning the distribution of land and sea during the Tertiary period, still less can be said in its favour, so long as all the globe, and especially the polar lands, have not been explored."

Baron Toll does not deny, of course, the usefulness of such hypotheses. On the contrary, they stimulate research; but the researches must necessarily be made. Besides, he points out that there are on the New Siberia islands distinct traces of glaciation, as also of elongated hills similar to the eskers of Courland, and of erratic boulders, brought perhaps from the Sannikoff archipelago, and he concludes for the necessity of exploring this archipelago in order to settle this question as well.

This paper is accompanied by two maps. One of these shows the position of both the pole and the 70th degree of north latitude, under the hypotheses of Neumayr and Nathorst. The other map is a large-scale geological map of the New Siberia islands, as well as those parts of the Yana, the Lena, the Olenek, and the Anabar, which were explored by Baron Toll's expedition.

A few words may be added to the important paper of Baron Toll. The necessity of exploring the Tertiary deposits in the far north, and especially in Sannikoff Land, as also in the land that was supposed to exist to the north-west of Novaya

Zemlya (Franz Josef's Land was not yet discovered at that time), and the far-reaching geological results which could be attained in this way, were indicated already as one of the main points of scientific interest in the report issued in 1871 by the Arctic Committee of the Russian Geographical Society, of which the present writer was the secretary. The discoveries of Czekanowski and Baron Toll have only added immensely to the interest of this question, by rendering the explanation still more difficult.

The whole question of the changes of climate on the Earth since the end of the Tertiary period—warm climate, even in high latitudes, at the end of the Tertiary period, immediately followed by glaciation, spreading to nearly equally low latitudes in North America and East Europe—continues to remain a puzzle for the geologist. And this question will remain unsolved until more data are supplied by the explorers of the globe in two different directions. Data of direct observation are of absolute necessity before any step can be made in the way of explanation, and these data must be of two distinct sorts. First of all, we must know how far north did the Tertiary vegetation spread, and in what direction it gradually lost its warm-climate character in proportion as it spread northwards. In this respect the exploration of Sannikoff's Land is *of the utmost value*, inasmuch as this problematic land is supposed to be situated almost on the opposite side of the globe (140° E. long.) to the spot of the Grinnel's Land (70° W. long.) where the Tertiary plants were found.

The other series of exploration must be directed to ascertain in how far *the glaciation of the southern hemisphere* was contemporary with the glaciation of our hemisphere, and *what was the climate in the equatorial regions during the same period*. So long as we do not possess reliable data in these two directions, all our hypotheses relative to changes of climate on the Earth, or of the Earth's axis, will possibly remain more than problematic.

One probable hypothesis relative to the possible cause of the Glacial period has been pointed out by the great physicist, Arrhenius; it is the increase of carbonic acid in our atmosphere, which would be sufficient to explain the cold period which our Earth lived through in the Post-Pliocene period. The numerous and large-scale volcanic eruptions towards the end of the Tertiary period, the traces of which have lately been discovered in immense quantities by the explorers of Siberia and Asia altogether, have brought a new argument in favour of the hypothesis of Arrhenius. These eruptions, which took place all over the immense border-ridges of the great plateau and on the plateau itself, certainly *must* have thrown masses of carbonic acid into our atmosphere. However, the hypothesis of Arrhenius, while giving a most valuable hint for the exploration of the Glacial period, leaves still the presence of Tertiary floras within 8° 15' from the pole in Grinnel's Land and 16° in New Siberia quite unexplained. Only a full knowledge of this extraordinary flora and of its full extension in arctic regions—in *the American archipelagos as well as in the Siberian ones*—will permit physicists and astronomers to make a further step in the proper direction, and to suggest to the geologists a possible cause of such changes of climate as took place since the end of the Tertiary period.

THE MONTHLY RECORD.

THE SOCIETY.

The National Antarectic Expedition.—Since the President delivered his address, considerable progress has been made in the preparations for the National Antarectic Expedition. The commander and one of the

executive officers have been appointed; they are the "two excellent young officers" spoken of in Mr. Goschen's letter to the President (see p. 13). The commander is Lieut. Robert F. Scott, R.N., of H.M.S. *Majestic*, and the executive officer is Lieut. Charles Royds, R.N., of H.M.S. *Crescent*. As has already been stated, Prof. J. W. Gregory will be the chief of the scientific staff; other members of the staff will be Mr. T. V. Hodgson, of the Plymouth Biological Station, and Dr. R. Koettlitz, of the Jackson-Harmsworth Expedition. Prof. Pollock, professor of Physics in Sydney University, will be invited to join the staff. The name of the vessel will be the *Discovery*, a name which from the earliest times has been borne by ships of the British navy that have carried the British flag into unknown regions all over the globe.

Mr. John Coles.—The Council have decided to award to Mr. Coles the Murchison Grant for next year, as an acknowledgment of his services to geography during his long tenure of the offices of Map Curator and Instructor to the Society.

ASIA.

M. Bonin's Journey in Central Asia.—A letter from M. Bonin, dated "Karashar, December 31, 1899," is printed in the March number of *La Géographie* (cf. *Journal*, vol. xv. p. 417). From Liang-chau the traveller had crossed the parallel ranges of the Nan-shan to Kuku-nor, returning to Kan-chau by a new route. Afterwards he made his way by Su-chau and Ngan-si to Sha-chau, whence he pushed on westwards into the desert for a space of two degrees, and came near perishing for want of water. The only practicable route to Lob-nor proved to be that along the Altyn (or Astym) Tagh, presumably the one followed by Mr. and Mrs. Littledale in the reverse direction in 1893. In the westward reconnaissance, however, M. Bonin had the satisfaction of finding traces of the old commercial route between China and the west, followed, in his day, by Marco Polo. They consisted in towers in perfect preservation, and remains of a great wall and ancient city. During the journey along the Altyn Tagh, where considerable altitudes seem to have been reached, the party incurred many hardships from cold, want of water, and even of food, while no living human beings were seen until Lob-nor was reached. The meeting with Dr. Hedin, alluded to in our last number, took place on the banks of the Yange-kul. M. Bonin hoped to proceed from Karashar by a new route across the Tian-shan to Urumtsi, and thence to Kulja.

The Second Danish Pamir Expedition.—Lieut. Olufsen gave an account, in March last, before the Berlin Geographical Society, of his second expedition to the Pamirs, during which a winter was spent in the region of the upper Panj. The report of the paper appears in the *Verhandlungen* of the Society (1900, Nos. 2-3). The route of the expedition, as has been recorded from time to time in the *Journal*, led from Osh south by the Taldyk pass and the Kara-kul to the Alichur Pamir, which was followed down to the Yeshil Kul. Here a stay was made for some time, soundings being taken of the lake, and a survey of its surroundings made. The proceedings of the travellers, and especially the canvas boat in which the lake was navigated, made a great impression upon the Kirghiz, who believe that the waters are inhabited by various monsters. The examination of the Yeshil Kul and other lakes in its vicinity was made principally with a view to elucidating the apparent diminution of the water-supply of Western Turkestan. This Lieut. Olufsen connects with a gradual desiccation of the Pamirs, evidence of which was

seen in the fact that the lakes alluded to must once have formed a single body of water, with a circuit of some 125 miles. From Yeshil Kul, where ruins with Chinese inscriptions as well as Kirghiz memorials were examined, the expedition proceeded by the Khargosh pass to the Panj valley and Wakhan. Here special attention was given to the question of former habitation by the Sia-posh, which Lieut. Olufsen had before thought probable, and which he regards as proved without question by the additional researches made during this second expedition. Traces of this people were everywhere seen in the form of ruins of fortresses, while inscriptions and other remarkable antiquities were discovered. On the northward march to Khorok, on the Gund river, where winter quarters were established, the leader made an interesting excursion across the eastern mountain chain, reaching a deep valley inhabited by a primitive race. During the winter, which set in in earnest in the middle of November, much information was collected relative to the ethnography of the region, while the regular course of events was varied by an excursion north to Kala-i-Wamar. The final start for the return journey was made on March 1, 1899, the country being still blocked by snow, and travelling extremely difficult. Night temperatures as low as 22° below zero Fahr. were experienced.

Kozloff's Expedition to Mongolia.—Further news respecting this expedition, the proceedings of which down to the arrival at Kobdo were described in the *Journal* for January last (p. 56), has since been received by the Russian Geographical Society (*Petermanns Mittheilungen*, No. 4). The examination of the Gobi-Altai region was concluded by detachments of the party, following different routes. M. Koznakoff followed the foot of the Altai from Kobdo to the meridian of Urga, crossing the range from time to time; while M. Ladygin was commissioned to attempt the passage of the Gobi by the route, hitherto untrodden by Europeans, from Uliasutai to Yui-min-sian. The leader himself hoped to cross the Gobi on the meridian of Lian-chau in the direction of the Edsin-gol river, afterwards passing through Alashan and joining the other detachments of his party before proceeding to Sining.

The Population of China.—A critical examination of the question of the population of China is made in the May number of the *Deutsche Rundschau* by Herr E. M. Köhler. Although himself closely acquainted with many parts of China, the writer makes no attempt at an original estimate of the density of population, holding that, however inexact the methods used by the Chinese authorities in their censuses, these must at least be more trustworthy than estimates on the part of foreigners, who generally know only a small part of the country. He quotes the figures given by Chinese chroniclers from the earliest times, giving in detail the results of the censuses of 1711, 1753, and 1812, and of an estimate made by the Marine Customs Department in 1882, which last put the total population of the eighteen provinces, in round numbers, as 380 millions. Not only, the writer holds, are the results of these censuses the most reliable existing, but the respective figures agree well with what might *a priori* have been anticipated from the course of Chinese history in the intervals between the censuses. Herr Köhler then proceeds, assuming the approximate correctness of the Chinese official figures, to consider whether the country must be held to be over-populated. This question he answers in the negative, showing the various directions in which China possesses exceptional advantages as regards food-production. Allowing for the fact that much of the soil is capable of producing two or even three harvests in the year, he finds that there are 2.75 acres of arable land per head of the population, an amount far greater than in most of the countries of Europe. In this again, however, he bases his result on a Chinese estimate of the area of arable land. Against this reliance on Chinese figures may be quoted the statement of Mr.

Colborne Baber (*Proc. R.G.S.*, 1883, p. 442) that the native census is "an authority which must seem utterly untrustworthy to any one acquainted with the lower class of Chinese officials who would be employed on such work." That parts, at least, of the country are over-populated, could hardly be denied by the writer, in the face of positive statements of travellers. Thus Mr. Litton, in his report on a journey in Northern Su-chuan, speaks of the widespread distress which must there follow even a slight failure of the crops.

New Light on an Old Country.—The publication of Mrs. Theodore Bent's recent volume* makes a valuable addition to the scanty literature of a most interesting country. By the sad death of her fellow-traveller, only four days after his return from his last journey, the task has devolved on her of putting together in connected form the varied information collected during repeated visits to Southern Arabia, with a personal narrative of the events of the journeys. This has been accomplished with much success, the material having been combined into a readable whole, derived partly from Mr. Bent's own papers and note-books, and partly from the journals kept by Mrs. Bent herself during the journeys. The most important part of the book is that devoted to the Hadhramut and Dhofar, the exploration of which was carried out in the winters of 1893-94 and 1894-95. Other sections, however, deal with the Bahrein islands, Maskat, the Fadhli country near Aden, and Sokotra, while the African coast of the Red sea, visited in 1895-96, is treated of in an interlude. So little has been hitherto known of Southern Arabia, that Mr. Bent's journeys, although confined within comparatively small compass, have added to our knowledge alike of the physical features, ancient history, and modern conditions of the country. An excellent description is given of the Akaba or elevated tableland, out of which have been cut, as by a knife, the main and branch valleys of the Hadhramut. These, in Mr. Bent's opinion, must have originally been due to the action of the sea. They have in course of time been silted up to a considerable height, possibly owing to the constant destruction of the myrrh and frankincense trees which has been going on for ages. The most interesting region visited was, however, that of Dhofar, respecting which the travellers are enthusiastic for the fertility of its valleys and mountains (the latter inhabited by the Gara tribe), and its delicious health-giving air. From an archaeological point of view its interest is no less, for on its coast Mr. Bent believed that he could identify the ancient Abyssopolis frequented by the frankincense merchants, in the neighbourhood of a stupendous wall hung with stalactites, and described as the most magnificent natural phenomenon ever seen by the travellers. The harbour (not marked on the Admiralty chart) could easily be restored to its former condition, and, lying midway between Aden and Maskat, and on the only fertile stretch of the whole southern coast-line, might be capable of great development. Of the present condition of the natives of Southern Arabia the picture presented is anything but pleasing. The fanaticism of the Hadhrami is such as to make friendly intercourse next to impossible. Religion is the moving spirit of the place, and without it the whole Hadhramut would long ago have been abandoned as useless. One enlightened chief was, however, met with in the person of the Sultan of Shibahm, who has spent twelve years in India, and whose love for things Indian and English is unbounded. At Shibahm traces of very early occupation were discovered, the place having been the centre of the frankincense trade centuries before our era.

* 'Southern Arabia.' By Theodore Bent, F.R.G.S., F.S.A., and Mrs. Theodore Bent. London: Smith, Elder. 1900.

AFRICA.

Dr. Donaldson Smith's Expedition.—Dr. Donaldson Smith sends a short account of his recent journey, of which the following is an outline. Starting from Berbera on August 1, 1899, he proceeded *viâ* Hargeisa and Milmil to the Shebeli, striking thence south-west in part by his route of 1895 across the Juba and Dana to the south end of Lake Stefanie. The Boran people were most friendly, and were anxious to be freed from the rule of the Abyssinians, who, however, had not been hard upon them. In various parts of the route un-mapped country was traversed, and near Stefanie some beautiful high mountainous country was explored. The survey work, carried out in part by Mr. C. Fraser, gave results coinciding satisfactorily with those obtained on the former journey. After visiting the great bend of the Omo, Dr. Smith pushed west, in about $5^{\circ} 30' N.$, with some deviations to the north or south caused by intervening ranges of mountains, some of which were very charming and supplied excellent grazing. No perennial rivers were crossed, only "Tugs" or Wadis.* After travelling a long distance, a great plain, extending west and north-west, was reached. It seemed to extend north to the Pibor and Sobat, and west towards Gondokoro. In the rainy season it is a marsh, and in the dry an impassable waterless desert, with nothing but loose cotton soil, full of cracks and holes and burning hot, the elevation being only 1500 feet. This was skirted along the foothills of some rich mountainous country until, on the meridian of Taransole, Dr. Smith turned sharp south to that populous town. Here the triangulation, of which an unbroken chain had been kept up from Lake Rudolf, was connected with Colonel Macdonald's surveys to Laluka. A westerly route was then taken to Fort Berkeley on the Nile, which was reached on March 15, 1900. Mr. Fraser took the men to Uganda and Mombasa, while, after waiting some time at the fort, Dr. Smith obtained a passage to Omdurman in Major Peake's steamer. The results of the expedition include, in addition to the surveys, extensive zoological, botanical, and ethnological collections. The fauna changed almost entirely after the Omo had been passed, and the species obtained, especially of birds, probably include many new to science.

Egypt in 1899.—Lord Cromer's reports to the Foreign Office on the finances, administration, and condition of Egypt and the Sudan in 1899 have recently been issued as a parliamentary paper. They show that, in spite of all drawbacks, the general progress made during the year was decidedly satisfactory. The accounts for 1899 show a surplus of £E.402,000, the revenue having reached the highest figure yet recorded since the British occupation. The value both of imports and exports, but especially the latter, showed a considerable rise as compared with 1898. The increase in exports was largely made up by the unusually large value of the export of cotton, due partly to the late enhanced prices, but partly also to an increase in amount. Cane-sugar likewise showed an increase both in quantity and in price. Eggs, a comparatively new item in the list, were exported to the value of £E.43,000. The railway traffic returns show a satisfactory increase in the transport of coal, machinery, timber, etc. Promising results have been obtained from the agricultural light railways, of which a length of 430 miles has been constructed since 1897, 209 miles having been opened for traffic in 1899. A large increase in receipts may be expected when the rolling stock has been made adequate to the demands upon it. The construction of agricultural roads also proceeds steadily, while difficulties in the way of the extension of the telegraph system are in a fair

* Dr. Smith must therefore class as such the Ruzi of Captain Wellby, which he must have crossed in this section of the route. He says, however, that the Wadis did not run with the Sobat.

way to be overcome by the formation of plantations of trees suitable for posts, young men being trained as foresters. The greatest obstacle to progress arose, of course, from the unprecedented failure of the Nile flood, and it speaks well for the value of the work accomplished in the direction of improved irrigation, that the ill effects of the low Nile have been kept within such small limits. On January 15, 1900, the discharge at Assuan was 578 cubic metres per second, as compared with 955 in 1889, the worst year previously known. Yet, assuming that a similar failure will not occur during the present year, no famine is to be feared, while the steady progress lately maintained in various directions has hardly received any serious check. The low Nile has favoured the operations for the great Nile reservoirs, good progress on which is reported. At Assuan, over 500 yards of the dam from the eastern bank of the river had been completed, before the end of 1899, to within 2 metres of its full height. The survey department, the work of which during 1898 was referred to in the *Journal* for December last (vol. xiv. p. 663), has continued its operations. The revenue survey of Sharkieh, Gharbieh, and Ghizeh, is almost completed, while the Sinai peninsula has been surveyed geologically, as well as the Fayum province. Good progress has been made with the Nile fish survey commenced in May, 1899. The report on the Sudan is hopeful, though the recent date of the final release of the country from Dervish thralldom precludes the possibility of great results at present. The population has wasted away under Dervish rule, and time must elapse before prosperity returns to the tribes. As regards the frontiers of the Sudan, good progress has been made with the delimitation on the side of Eritrea, and the general basis of an arrangement with Abyssinia in respect of the country west of the Blue Nile has been settled. Among the special points dealt with are the gum trade (which seems capable of development), railways and telegraphs, game preservation, anti-slavery operations, etc. The traffic in slaves has not yet been checked to any large extent, but it is hoped that vigorous measures will soon lead to more decided results.

The White Nile free of Sudd.—The successful completion of the task entrusted to Major Peake of removing the obstruction to navigation from the White Nile has lately been announced. That officer, who is now on his way home to England, reports that from Khartum to Fort Berkeley, on the upper Nile, navigation is now open throughout, and that this route will allow a saving of two months in the transport of supplies to Northern Uganda. This probably refers to existing circumstances, for on the completion of the Uganda railway the difference between the two routes could hardly be so great, though even so that by the Nile would appear to have the advantage for the parts of the Protectorate not immediately served by the railway.

The Harrison-Whitehouse Expedition.—A recent telegram announces the return to the coast of the Harrison-Whitehouse expedition to the countries south of Abyssinia. The attempt to strike westward from Lake Rudolf to the Nile was of necessity abandoned, owing to want of water and the uninhabited nature of the country, and the southward route to Mombasa *via* Baringo was adopted instead. The whole country around Lakes Rudolf and Stefanie was found to be deserted, its inhabitants having either died or left the country. The Europeans of the expedition enjoyed excellent health, and most of the baggage animals came safely through the journey. The leaders reached Bombay in the middle of June.

Count Leontieff's Expedition to Lake Rudolf.—A note in the April number of the *Geographische Zeitschrift* gives some particulars respecting Count Leontieff's latest expedition to the south of Abyssinia, from which he has now returned to France. The main object of the journey was, as is well known, to extend Abyssinian supremacy to Lake Rudolf; but results of value from a scientific point of

view are said to have been obtained also. The expedition left Addis Abeba in June, 1899, and reached the lake in August, after investigating the whole system of the Omo.

The Italian Somali Coast.—Information respecting the present condition and prospects of the southern half of the Italian Somali coast (known as the "Beradir" coast), is reproduced in Nos. 2-3 of the *Revista Geografica Italiana*, from a report by the Italian Consul at Zanzibar. Beginning from the north, the report describes successively the ports and stations of Adale, or Itala, Warsheik, Mogdishu, Merka, Brava, and Jumbo, at the mouth of the Juba, opposite the British station of Kismayu. At several of these, especially Mogdishu (the centre of government), Merka, and Brava, considerable commercial development has been noticeable within the last few years, though the actual amount of trade is nowhere great. The great want appears to be that of good anchorage, none of the ports affording good shelter for large ships, while even for native craft they are by no means favourable. Brava is the best situated in this respect, and the consul thinks that the anchorage might be still further improved. The wildness and treachery of the Somali tribes renders the agricultural development of the territory difficult, though land suitable for cultivation exists, the products capable of being grown including sansevieria, agave, coconuts, durra, sesamum, and cotton. The inhabitants are most peaceably disposed at Mogdishu, where almost perfect security prevails, both in the city and its environs. Its population amounts to about six thousand. Summing up, the consul is of opinion that even at present the Benadir coast need not be depreciated, but that improvements, in the direction of greater facilities for communication, and the development of new resources, are desirable. Much might be effected, it is thought, by means of irrigation, for which the Shebéli and Juba might be drawn upon.

Arrival of Major Gibbons on the Nile.—The arrival of Major Gibbons at Afuddi, on the White Nile opposite Dufilé, on May 3, has been announced. The traveller, who, according to his programme, had made his way from the upper Congo *via* Lake Tanganyika, was awaiting the arrival of an Egyptian steamer to continue his journey northwards down the Nile. Major Gibbons's journey, which is thus practically brought to a successful close, will take a high place among the geographical achievements of recent years.

Physical Geography of the Ivory Coast.—An unusually clear idea of the physical geography of the Ivory Coast is given in the *Annales de Géographie* for March 15 by Captain Thomasset, a member of the railway survey party, headed by Captain Houdaille (cf. *Journal*, vol. xiv. p. 211). After enumerating the topographical results of the mission, which filled in considerable blanks in the maps between the Komoe and Bandama rivers, the writer goes on to sketch the surface features in their relation to geology and to the physical history of the region. He divides the country into a coast and a continental region, the line of partition being taken to be "the contour-line corresponding to the mean altitude of the littoral ridge which forms the actual shore-line." Although apparently an arbitrary line, this is said to agree closely with the ancient shore-line of this part of West Africa. It is extremely sinuous, running sometimes close to the sea, at others as much as 25 miles inland, so that the coast must formerly have been cut up by creeks and deep bays, although at the present day the shore is extremely regular. Taken as a whole, the old shore-line seems to have formed a shallow gulf extending from the Sassandra to Axim. In course of time a bar of sand was formed across the chord of the bay, whereupon the interior portions became gradually silted up by the material brought down by the rivers. A striking description is given of the configuration of the continental region, the surface of which is cut up into plateaux

with steep margins, furrowed by ravines and jutting out into promontories. Between them flow streams with tortuous courses, which unite into larger rivers flowing in alluvial plains of greater or less extent and generally swampy in the rains. This configuration extends inland at least to 7° N., the plateaux, however, becoming gradually more extensive and their margins less broken. Their relative height is not great, and no altitude greater than 600 feet has been found within 150 miles from the coast. The layer of surface soil is exceedingly thin,* in spite of the amount of decaying vegetable matter derived from the forests which cover the country. Captain Thomasset suggests that the rapid decomposition transforms much of the *débris* into gaseous or soluble substances, while the retention of any on the surface is, he thinks, due to the protective action of the forest.

The Congo-German Frontier in the Kivu Region.—An agreement between Germany and the Congo State, signed on April 10, provides for the delimitation of the common frontier of the two countries in the neighbourhood of Lake Kivu, in regard to which uncertainty has for some time prevailed, owing to ambiguity in the original agreement of 1885. According to former maps, the lake was placed to the west of the line as originally drawn, whereas recent explorations have shown that it lies to the east. Pending the settlement of the question (which is to be preceded by a survey of the territory by a mixed commission), instructions have been sent to the Congo officials to abstain from all political action in the region in question.

Preservation of Wild Animals in Africa.—A convention was signed in London on May 19 between the representatives of Great Britain, Germany, France, Italy, Spain, Portugal, and the Congo State, embodying the recommendations of a conference which met to consider the steps advisable for the preservation of wild animals threatened with extinction in Africa. The convention merely lays down principles which it is thought desirable to follow in furtherance of the end in view, the carrying out of suitable measures being left to the respective governments having possessions in Africa. The first article fixes the limits of the area affected by the decisions of the conference, the whole of Africa from 20° N. to a line following the northern boundary of German South-West Africa and the Zambezi being included. In the second article a number of means conducive to the preservation of wild animals are enumerated, and in the third the contracting parties bind themselves to introduce such measures into their African possessions. The remaining seven articles deal with miscellaneous points having reference to the carrying out of the convention. Among the measures suggested, the most important include prohibition of destruction in the case of (a) certain species either useful, as the secretary bird, or threatened with extinction, as the giraffe; and (b) the young, and females accompanied by young, of the elephant, rhinoceros, hippopotamus, zebras, buffaloes, and the various antelopes and gazelles; the limitation of the numbers killed when adult of the same animals and others, including small carnivores and monkeys, game and other birds, etc.; the establishment of game reserves and close seasons; prohibition of hunting without licence; imposition of export duties on hunting trophies; and the confiscation of all elephant tusks weighing less than 5 kilogrammes (11 lbs.). On the other hand, the application is recommended of measures for the sufficient reduction of the numbers of harmful animals, such as the larger carnivores, baboons, and crocodiles. It is, perhaps, matter for surprise that the same protection should be given to the rhinoceros, which in some districts is positively dangerous to life, as to such game as

* The same fact was remarked by Dr. Freeman in reference to the Ashanti forests, but the explanation given by the two writers differs, the British traveller attributing the thinness of the surface layer to the excessive rainfall.

antelopes, etc. Yet without such protection the animal would be in special danger of extinction, and the requirements of particular districts are, it may be supposed, met by the relaxation allowed in certain cases by Article III. This covers, in particular, the case of collection for scientific purposes.

Togoland.*—Recent activity in the various West African colonies has hardly, down to the present, given rise to a literature comparable with that relating to other parts of the continent. The publication of a work on one of the least known of these—Togoland—by an observer who, during a lengthened stay in the country, has had extensive opportunities of acquiring accurate knowledge, is therefore welcome. Although in the main based on personal observation, Herr Klose's journeys extended over so much of the territory, that the picture presented is a comprehensive one, while the author has supplemented his account from the information obtained by other travellers. Special weight has been given to all questions affecting the economic development of the territory, as to the possibilities of which the author holds sanguine views. He insists on the value to Germany of colonies capable of producing the tropical products needed for home consumption (among which he regards coffee as offering favourable prospects to planters), and points to the hardships and difficulties encountered in the early English and other colonies as proof that such may be successfully overcome by persevering effort. The book contains much valuable information on the natives of Togoland, whose manner of life, arts, and industries, etc., are fully described. Especial attention is given to the Bassari, who inhabit the interior of the country in the vicinity of 9° N., and among whom a German station was established. They have hitherto been little touched by outside influence. Their country marks the furthest advance southwards of the Fulbe herdmen, whom the author thinks it might be advisable to settle in the districts nearer the coast in order that they might introduce the rearing of cattle into them. On one of his journeys the author visited the site of the once flourishing market of Salaga, which he says has ceased to exist as such, and of which little remains to indicate its former importance. The book contains many excellent illustrations both of country and people, mainly from the author's photographs.

Geological Research in Northern Nyasaland.—Dr. Dantz, whose geological work in the northern parts of German East Africa has already been alluded to in the *Journal*, continued his investigations, at the end of 1899, in the region north of Lake Nyasa, and the main results of his journey are summarized in the first number of the *Mitteilungen aus den Deutschen Schutzgebieten* for the current year. As regards the main features of the country, Dr. Dantz's conclusions are in full agreement with those of Herr Bornhardt (*Journal*, vol. xv. p. 421). He characterizes the Rukwa depression as a typical rift valley ("Grabenverwerfung"), although the fact had been doubted by some geologists. It joins the main trough a little east of Utengule, the zone of junction being marked by the mountain group of Rungwe, Ngozi, etc., composed of basalt, trachytes, and other volcanic rocks. From the steepness of the sides of the Rukwa depression and the small amount of detritus found in their neighbourhood, Dr. Dantz thinks that the formation of the trough (and of the associated basalts and trachytes above mentioned) is a geologically recent event, and that the rainfall in this region was already scanty at the time. North of the Rukwa trough lies a mountain region of comparatively uniform elevation, all the streams of which—for the most part dry—trend towards the lake, and not towards the Ruaha. Dr. Dantz enumerates the principal geological formations met with, and also describes the sinter springs which occur in the valley of the Songwe.

* 'Togo unter Deutsche Flagge, Reisebilde und Betrachtungen.' Von Heinrich Klose. Berlin: Reimer. 1899.

AUSTRALASIA AND OCEANIC ISLANDS.

Voyage along the South Coast of New Britain.—A report by Dr. Schnee, representing the governor of German New Guinea, on a voyage made last year along the little-known southern coast of New Britain, appears in the first part of the *Mitteilungen aus den Deutschen Schutzgebieten* for 1900. The trip was made in company with Bishop Couppé in the mission steamer *Gabriel*, which left Herbertshöhe on November 18, and, rounding Cape Gazelle, ran along the coast to a point a little beyond Jacquinot bay. From Londip, halfway between Capes Gazelle and Palliser, to the south end of Jacquinot bay, the whole surface, both on the coast and in the interior, was found to be thickly covered with forest. Between Londip and Wide bay there are no villages on the shore, but plantations were seen on the mountains inland. From Wide bay onward, especially on the southern shore of the bay, many villages were seen, the people being generally friendly, though at first shy. In language, etc., they seem to have no connection with the inhabitants of the Gazelle peninsula. At Henry Reid bay, by which the neck of land uniting that peninsula with the mainland is narrowed on the south, the interior mountains sink to a plain, by which they appear separated from those of the main part of the island. Two streams which enter the head of the bay, one from the north-east, the other from the south-west, were ascended for some distance, but proved difficult of navigation. That from the north-east, known as the Henry Reid, has many eucalyptus trees on its banks. They were seen also in less numbers at the mouths of the smaller rivers. Coconut palms are entirely absent along the uninhabited part of the coast, and from Wide bay onwards they occur in small numbers only. It is hoped that the tribes of this coast may in time supply labour for the plantations, several individuals having at their own desire been taken to Herbertshöhe on board the steamer.

British New Guinea.—The annual report on British New Guinea for the year 1898-99 has lately been presented to Parliament. It perhaps contains less of strictly geographical matter than some that have appeared before, the governor's visits of inspection having been confined for the most part to the coast districts. Interesting trips by Government officers into the mountainous districts behind Port Moresby are, however, described. One of these, made by Mr. Ballantine, led by the road to the summit of the Astrolabe range into the district of the Hagari people, a mountain tribe which had previously been given to raiding, and had resisted the efforts of the authorities to bring them into amicable relations. Their country is extremely broken, and made up of steep hills and deep gorges, all clothed in dense forests. With the aid of friendly natives, the object of the expedition was achieved. About the same time an expedition under Messrs. Russell and Macdonald proceeded through a part of the same country to the "Gap," by which the main range is broken south-east of Mount Victoria, the principal object being to discover a suitable track for a road over the range. Beyond the Hagari villages unfriendly natives were encountered, but no fighting took place. From the summit of the Gap the party proceeded down the north face of the range to the Yoda, a tributary of the Mambare. The stream was crossed, but a retreat soon became necessary owing to the threatening attitude of the natives, whose attack had finally to be repelled by force. The Yoda bed was about 150 yards wide, but the river itself only 20 yards, and knee-deep. A definite conclusion as to the best route for a future road was prevented by the mountainous nature of the country, but the Gap itself seemed hardly capable of being traversed by pack-animals. From the Yoda to Tamaba station, on the Mambare, a good track could probably be found. The report on gold-mining does not show that any great results have been attained. The total yield of the Mambare or Gira field during the year is estimated at about

10,000 ounces. Gold has been recently found inland from Milne bay. A large area of land has been taken up by a company on the Musa river, where indiarubber is to form an object of cultivation. In the plantation of Messrs. Burns, Philp, & Co., on the Astrolabe range, at a height of 2600 feet, there are some twenty thousand growing plants of Arabian coffee, and more ground is being planted with seed. Sheep are being tried on the grassy hills. The desire on the part of the natives to live on friendly terms with the white men is said to be spreading, but the strength of the conservative instinct makes them slow to acknowledge the superiority of European ways. Where intellect has been sharpened, it is too often at the expense of character. Appendices to the report deal with a variety of matters—commercial, linguistic, meteorological, etc. The large-scale map of the possession, of which the four eastern sheets were issued with the previous report, is now completed by the publication of the nine relating to the centre and west.

British Agreement with Tonga.—By the Samoa agreement of last year, Germany waived all claim to political influence in the Tonga group, which, however, in the absence of a definite agreement with the native chiefs, did not at once become a British protectorate. An agreement has now been completed which virtually places the islands in that position, the conclusion of a treaty with any other power without the consent of the Queen being prohibited, while aid in case of need is only to be sought of Great Britain. It is said that the proclamation of an unconditional protectorate was opposed by the king alone, the majority of the chiefs being in favour of such a course.

The Future of the New Zealand Bush.—Canon P. Walsh, in a paper published in the last volume (vol. xxxi., 1898) of the *Transactions* of the New Zealand Institute, attempts to forecast the future condition of the New Zealand bush. In a previous paper appearing in the *Transactions* of the institute for 1896, the author drew attention to the extensive and rapid disappearance of the native bush in many parts of the country, and endeavoured to trace the principal agents which combine in the work of destruction. It was shown that the two chief factors, besides the axe of the bushman, are fires and cattle. By these means immense areas of forest have been destroyed, especially in the more settled districts. Great damage is at present being done throughout the districts of Taranaki, Manawatu, parts of the Wellington and Nelson provinces, and the Akaroa peninsula, where the native bush is said to be practically a thing of the past. It is pointed out that in all high altitudes, and especially in the mountainous districts of the south and west, the climatic and other conditions are favourable to the preservation of the bush in its virgin condition; while in numerous parts of the country the contending forces are nearly equally balanced, and those portions of the bush that will escape extinction will undergo a gradual but complete alteration in character and appearance. Often over large areas that have been wholly cleared a second growth appears, but this, both in size and variety, is said to be far inferior to the original bush. The most interesting and important constituent of the second growth is the tea-tree, which appears to thrive on almost all soils. Mention is made of the imported trees and shrubs, which have already added a new feature to the forest flora of the country. The author is hopeful that in a few years such terrible conflagrations as have lately overspread whole provinces will be things of the past. In predicting the appearance of the bush of the future, speaking generally, he says, "We may expect to see an infinite gradation between the portions which remain practically in their virgin condition on the mountain heights and sheltered gorges and the outlying fragments in the lower and cultivated districts, and that, in proportion as it is affected by the new conditions, the bush will be more clear and open, the trees fewer in variety, and of a shorter and bushier

habit. There will also be an increasing admixture of the foreign element, and less and less of the original undergrowth."

POLAR REGIONS.

The Peary Expedition of 1900.—A despatch dated June 9, from St. John's, Newfoundland, to the Brooklyn *Standard Union*, announces the completion of the repairs to the *Windward*, which had been in progress for some months, and sketches the programme for this year's voyage in support of Peary's north pole expedition. Although it has been found impossible to put new engines into the *Windward*, the whole machinery has been thoroughly overhauled, while the hull has been so strengthened that the ship is in better condition than she has been for some years. She will be commanded by Captain Samuel Bartlett, who took the *Diana* north last year. By special enactment of Congress, she will sail this year as an American ship, and will be the first arctic exploring vessel to fly American colours since Captain Hall's ill-fated expedition set out in the *Polaris* in July, 1871. According to the programme for the voyage, the *Windward* would sail from Sydney about July 1, proceeding, after a call at Disco, to Etah, in North Greenland, Peary's winter quarters, where either the explorer himself or instructions for future proceedings will probably be found. The *Windward* will take abundant stores of all kinds, including a large stock of coal and two completely equipped whale-boats. It is hoped that these additional supplies will enable Peary to complete his work, if indeed he has not already done so during the past spring. According to the last letter received from the explorer (dated August 28, 1899), he proposed to start north from Etah with the return of the sun, taking with him a large party of natives as far as Fort Conger, his advanced base, which should be reached in ten or twelve days. His further movements would depend upon conditions at the time, the alternatives being open of following the Greenland coast to its termination, and then striking north, or of starting north at once from Cape Hecla. Letters for Peary were sent early in the year to Dundee (Scotland), for conveyance to Cape York by the whalers. Beyond that point they would be forwarded by natives.

Relics of Sir G. Nares' Expedition.—Relics of the British Arctic Expedition under Sir G. Nares were sent home last year by Lieut. Peary, and have now been transmitted, as appears from the *Brooklyn Standard Union* of April 18, by the Peary Arctic Club to the Royal Naval College at Greenwich. They consist of the sextant left by Lieut. (now Admiral) Beaumont at Repulse harbour in 1876, and eight years later taken to Fort Conger by Lieut. Lockwood, of the Greely Expedition; and the record (dated September 7, 1876) left by Sir G. Nares on Norman Lockyer island. The sextant, which has remained in a wonderful state of preservation, was brought last year by Peary from Fort Conger to Allman bay, and thence despatched home in the *Diana*, together with the Nares' record, which, as regards both paper and ink, has remained unimpaired in the pure air of the northern regions. The relics were tendered to the British Admiralty in accordance with Peary's suggestion, and gratefully accepted by that body.

Payer's Map of Franz Josef Land.—The general accuracy of Payer's map of Franz Josef Land is once more championed, this time by Admiral von Brosch, one of the members of the Austrian expedition, in the *Mittheilungen* of the Vienna Geographical Society (1900, Nos. 1 and 2). The writer, who himself took part in the survey operations, describes the methods adopted in the triangulation of the newly discovered islands, and the astronomical work by which certain points were fixed. He insists that Dr. Nansen's own observations were not of a nature to entitle them to supersede the work of his predecessors, and though allowing that many small errors of detail would naturally occur in a survey such as Payer's, holds that the

groundwork of his map is certainly correct. The Austrian expedition made known Franz Josef Land as an island-complex, and the designation "land" attached to various parts of the same was never intended to imply the existence of continental areas. That heavy piled-up masses of sea-ice were taken by Payer, when seen from a distance, for the termination of a glacier is, the writer holds, easily intelligible.

Ice in Bering Sea.—The U.S. Hydrographic Office has recently issued a report on 'Ice and Ice-movements in Bering Sea during the Spring Months,' by Mr. James Page, of the division of Marine Meteorology, from which the following notes are extracted. Navigation of the waters to the northward of Bering strait is only possible during the months of August, September, and the early part of October, when the edge of the arctic pack-ice is generally found extending from Icy cape, on the coast of Alaska, westward to Herald island. Stretches of open water often reach as far as 25 or 30 miles to the northward of this island. Thence the edge of the ice extends in a south-westerly direction toward Cape North, on the coast of Siberia. Wrangell island appears to be at all times firmly enclosed within the limits of the pack. October 15 is regarded as the limit of the time during which it is safe for a vessel to be north of Bering strait. In this portion of the arctic young ice may form at any time after August 15. Port Clarence and St. Michael are ordinarily closed by ice by October 25. In mid-winter an impenetrable barrier of ice crosses Bering sea from east to west, starting at the head of Bristol bay, trending thence westward to a point some miles to the north of St. Paul island. Thence the direction of the barrier is north-westward into the bight on the Asiatic coast, between Cape Navarin on the north and Cape Orangutang on the south. The movement of the ice in Bering sea is closely connected with the direction of the prevailing winds, the majority of which, in this region, throughout April and May blow from the north-east, while throughout June southerly and south-westerly winds are prominent. Calms are most frequent during the winter months, reaching 14 per cent. during January. South-westerly winds occur in April, and mark the commencement of the retreat of the ice. To the northward of St. Lawrence island the ice remains impassable until late in the summer. The vessels of the Pacific Steam Whaling Company reach Unalaska in the latter part of March, and start northward about April 1-10. It is shown that the sea invariably opens along the west coast from Cape Bering to Indian point, and thence to East cape earlier than in any other portion. In conclusion, a brief summary is given of the actual conditions encountered during the years 1890-99, based mainly upon the reports contained in the log-books of the several vessels of the Pacific Steam Whaling Company, and a summary showing for each year since 1890, the date upon which each of the vessels entered the pack, the date of emergence into the clear water off Indian point, the route followed, and the date of arrival at Port Clarence.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

De la Métherie's Contributions to the Science of Physical Geography.

—Prof. S. Günther, whose appreciation of the work of Lichtenberg in the field of terrestrial physics was lately referred to in the *Journal*, discusses, in the *Mitteilungen* of the Vienna Geographical Society (1900, Nos. 1 and 2), the influence of the old writer De la Métherie on the evolution of physical geography. He begins by remarking on the striking analogies which may be traced between the ideas of the present day and certain which were current 100 to 150 years ago. In his 'Théorie de la Terre,' published just over a century ago, De la Métherie brought together the whole scientific knowledge of the time, combined with deep

research on his own part, in a way which, Dr. Günther thinks, entitles him to be regarded as a forerunner of those modern modes of thought in which it is a fundamental axiom that the greatest effects may be brought about by causes imperceptible in themselves, if only the time during which they act is long enough. He may, therefore, be honoured as a pioneer in a new method of inquiry. Dr. Günther briefly reviews the theories put forward by De la Métherie in the work above mentioned with regard to the various branches of physical geography, showing how remarkably his views accorded in many ways with those of modern investigators. This tendency towards modern geographical methods is well seen in his treatment of phenomena in their genetic relations; his ideas as to lakes and their various modes of origin being specially worthy of notice. The phenomenon of the "Seiche" was already known to him. A pleasing characteristic, Dr. Günther remarks, in summing up, is his universal endeavour to adopt simple, rather than violent, explanations of observed geological facts.

Degree-measurement in Spitsbergen.—Some details as to the programme for the present summer of the combined Russian and Swedish operations for the measurement of a degree in Spitsbergen are given in the fourth number of the *Verhandlungen* of the Berlin Geographical Society for 1900. After taking on board, at Trondhjem, the last members of the Swedish scientific staff, including Dr. Larcén, Herr Engström, and Captain Ringertz, the *Svensksund* was to proceed *via* Tromsø to Spitsbergen, where the ice-conditions in the neighbourhood of the Great fiord would be first examined. After moving the Russian party from their winter station, the *Svensksund* would, if possible, run north-west to the Swedish station, and the definitive measurements in the northern area of triangulation would be at once commenced. In case of hindrance by ice, operations would be inaugurated further south. According to the programme arranged, the Russian party, which would arrive somewhat later, would begin the work of measurement in the Great fiord, but, in the possible case of the ice conditions being more favourable on the northern coast, would proceed thither to join the Swedish party. The greatest difficulties will be involved in the connection of the northern and southern areas of triangulation, for which purpose many difficult ice-covered ridges will have to be crossed. The return of the *Svensksund* is not expected before the beginning of September. The programme was decided on, according to the *Deutsche Rundschau*, by a conference at St. Petersburg, at which Sweden was represented by Baron Nordenskiöld and other Swedish savants.

The Dutch Deep-sea Expedition.—The third number of *Petermanns Mittheilungen* for the present year contains some information as to the proceedings of the *Siboga* expedition in the Malay archipelago during the latter part of 1899. Leaving Saleijer on October 26, Prof. Weber again crossed the Banda sea to Amboina by a new route, afterwards touching at Banda and the Ke islands *en route* for the Aru group. The proposed examination of Timor-laut was given up, owing to the news that three Dutch officers had been seized by the natives on the South coast of New Guinea, which made it necessary to return to Amboina for assistance. Unfortunately this arrived too late, the officers having been murdered before the arrival of the Dutch war-vessel, which had been at once despatched from Amboina. Prof. Weber's soundings prove that the Banda sea forms a deep depression, depths of over 2000 metres (1100 fathoms) being met with throughout, while east of the island of Banda a sounding of 5684 metres (3100 fathoms) was obtained. The depth of 4000 fathoms (7200 metres) marked on the charts seems to have been due to a confusion of metres and fathoms. Banda is not, as has been thought, connected with Ceram and Amboina by a submarine ridge, but rises independently

out of depths of over 4000 metres (2190 fathoms). In the east the Banda sea is shut in by lesser depths as far south as the Ke islands, but between the latter and Aru a channel reaching 3565 metres (nearly 2000 fathoms) supplies a connection with the Arafura sea. The final section of the cruise, from which Prof. Weber has now returned to Europe, was commenced on January 8, 1900 (*Petermanns Mitteilungen*, No. 5). Proceeding southward from Amboina, and again obtaining deep soundings in the Banda sea (2687 fathoms in 5° S.), the expedition ran along the south coasts of Timor and Flores to Sumbawa, afterwards touching at the Paternoster Kageang and Bawean islands *en route* for Surabaya. The most important discovery is that of the inaccuracy of existing maps of Timor, the south coast having been misplaced southwards, so that the size of the island has been exaggerated. The difference in one place is said to amount to almost 15', and the true area to be smaller by one-eighth than has been hitherto supposed.

The Study of Scenery.—In his little book on the origin of scenery,* Mr. Marr renders a great service to students of geography as well as to geologists. At the same time the appreciation of natural beauty revealed in the work will commend it to many readers who may not be serious students. The book deals with the origin of scenery in general, and the illustrations are drawn from the whole world, thus allowing the best types of each characteristic form to be presented to the reader. As an introduction to Geomorphology, "a subject which has sprung from the union of geology and geography," as Mr. Marr puts it, it is the most systematic treatise yet published in the English language. After recapitulating a few of the main facts of geology, the author gives a series of chapters on the production and general structure of continents and ocean basins, and more detailed discussion of the various typical land-forms—mountains, valleys, lakes, volcanoes, plains, and plateaux, and on the specific action of ice and water on the land. Numerous references are given to the literature of the various subjects, and it is gratifying to notice the frequency with which Mr. Marr has referred to the pages of this *Journal* in the course of his descriptions.

GENERAL.

Geography at Oxford.—A further important step has been taken in the recognition of geography at Oxford University. In connection with the School of Geography there, the University has decided to institute a diploma in geography, which will be awarded, after examination, not only to Oxford students (male and female), but also to outsiders who have attended the school.

Geography in the University of London.—Parliamentary papers recently issued contain the Statutes, the Regulations, and a Report to accompany the Statutes and Regulations of the University of London, reorganized as a teaching body. The first regulation enumerates thirty-two projected boards of studies, one of which is "A Board of Geography for Physical Political and Commercial Geography," while another is "A Board of Economics and Political Science (including Commerce and Industry)." It is thus apparent that geography is intended to be recognized as a subject of primary importance, apart from such incidental consideration as it may receive under political science and commerce. Section 97 of the Statutes provides, "In the mean time and subject to any other order of the Senate the several boards of study enumerated in Regulation I. shall be appointed as soon as conveniently may be. In appointing the boards of studies the Senate

* 'The Scientific Study of Scenery.' By John E. Marr, M.A., F.R.S. London: Methuen & Co. 1900.

shall aim at securing to representatives of every subject of University study opportunity of expressing their views to the Senate." It is further provided that the members of each board shall be appointed annually by the Senate from amongst such members of a faculty as teach or examine in the subjects provided for in the board, with the addition of other persons which the Senate may think fit to appoint, but these "other persons" are not to exceed in number one-fourth of the members of the board. The Faculties of the University are fixed as eight in number, viz. Theology, Arts, Law, Music, Medicine, Science, Engineering, and Economics and Political Science (including Commerce and Industry). The question arises as to how the thirty-two boards of studies are to be distributed amongst the eight faculties, and this is particularly interesting as regards geography. The natural association would either be with the Faculty of Arts or that of Science. If put under the Faculty of Economics and Political Science, it would be in the anomalous position of being included as a portion of a sphere of learning of less scope than itself. The only teacher of geography recognized in the first list of members of the faculties is Mr. G. G. Chisholm under the Faculty of Economics. Nothing is said as to the provision of new professorships in the University, except that "so soon as the funds of the University permit the Senate shall found such professorships as it may think fit and prescribe the conditions on which they shall be tenable and may provide lecture-rooms museums laboratories workshops and other facilities for the purpose both of teaching and of research." While numerous educational bodies, of which University College and King's College are the chief, are admitted as schools of the University, there is also provision made that "the Senate may also admit any institution founded for the promotion of science or learning within the administrative County of London including the County of the City of London as a school of the University for the purpose of research or the cultivation of any special branch of science or learning." Thus it appears possible that geography may be included in the curriculum of the University of London, although the time when it will be so recognized is probably still distant.

Geographical and Geological Terminology.—A note in the *Revista Geografica Italiana* (1900, 2-3), by Olinto Marinelli, deals with the confusion which arises from the promiscuous use, in much of the geographical literature of the present day, of the same terms to denote the entirely different conceptions involved in the study of geographical and geological surfaces. The blame is due, in part, the writer thinks, to the tendency of geographers, or pseudo-geographers, who have no real acquaintance with geological principles, to adopt the technical terms applicable to geological phenomena, in the place of the more popular phraseology which naturally belongs to the orographical relief of a country. On the other hand, from the degree of analogy which exists between geographical and geological surfaces, geologists, whose vocabulary must of necessity be extensive, sometimes make use of popular terms to express purely geological conceptions. This may be admissible provided the sense is made clear by the addition of the words "geologic," "tectonic," etc., to the terms employed, whereas the use of such expressions as "syncline," "anticline," "fold," etc., in a geographical sense, is entirely to be deprecated. Signor Marinelli's remarks do not, of course, apply to strictly morphological terms, the use of which must be common to the two sciences, as they indicate mixed conceptions.

The "Silver Map" of Drake's Voyage.*—Mr. Miller Christy calls attention, in his recently issued monograph on the silver medallion illustrating

* "The Silver Map of the World," a contemporary medallion commemorative of Drake's great voyage. By Miller Christy. London: Henry Stevens. 1900.

Drake's voyage, to one of the most interesting cartographical relics of the latter part of the sixteenth century. Notice has previously been directed to the points of interest presented by the medallion as such, but its importance to students of historical geography has hardly been sufficiently recognized. Three copies are known to exist, two being now in the British Museum, to which they were presented by Sir Wollaston Franks, while the third is in private hands. Although at first sight resembling engraved work, the identity of the three in the smallest details proves them to have been cast or struck. Their diameter is a little under 3 inches, but, in spite of this small size, the geographical features are represented with surprising fullness and accuracy, and the map is evidently the work of a first-rate cartographer. It bears no fewer than one hundred and ten geographical names in the two hemispheres (one of which is shown on either face), besides various legends or inscriptions. Drake's route is shown by a dotted line, and the medallions were evidently struck in commemoration of the voyage. Mr. Christy discusses the question of the date and authorship of the map, placing the former at 1581, or the year after Drake's return, and showing the great probability that it was by the same cartographer as the map issued in Paris in 1587 to accompany Hakluyt's edition of Peter Martyr's '*De Orbe Novo*.' The arguments in favour of quite such an early date can hardly be said to be conclusive, though there seems no doubt that the map dates from one of the last two decades of the sixteenth century. Again, while with reason rejecting the theory which attributes the silver map to Hondius, Mr. Christy seems hardly to attach weight enough to the resemblances between the latter's map illustrating the voyages of Drake and Cavendish and the silver map, which, especially in the Australian region, are such as to argue at least some connection between the two.* Mr. Christy says little about the general geography of the silver map, his chief attention being devoted to its delineation of the arctic regions. In this connection he shows the origin of the erroneous representation of Frobisher's discoveries on maps of the period, and enters into a discussion on Zeno's narrative and chart. The latter, he thinks, may have had more foundation in fact than Mr. Lucas believes, although he allows it to be fictitious in its connection with Zeno's story. Photographic reproductions of various contemporary maps, including the Paris map above alluded to, accompany the essay.

OBITUARY.

Miss Mary H. Kingsley.

WE regret to record the death, announced by telegram from Cape Town early in June, of Miss Mary H. Kingsley, the well-known West African traveller, who early this year had proceeded to the Cape, and, having offered her services to the authorities at the military hospital at Simonstown, there contracted the illness of which she died. Miss Kingsley was the elder child of the late Dr. G. H. Kingsley, brother of Charles and Henry Kingsley, and himself the joint author (with the late Earl of Pembroke) of a well-known book of travel relating to the South sea. Devoting herself to scientific studies, she chose the West African coast lands as a field for original

* In addition to the representation of the southern continent, which in both cases may have been derived from Mercator's world-map of 1569, a striking agreement is seen in the positions assigned to the islands of the archipelago, and in the direction of Drake's route through the same. There is also much closer agreement in regard to the islands off the coast of California, than in the case of the Paris map, which does not, as Mr. Christy states, insert *all* the names contained in the Silver Map.

research in the subjects which exercised a special attraction for her, zoology and anthropology. Her work did not, therefore, lead her into any entirely unknown countries, and her contributions to geographical science were but incidental to her more definite labours in other fields. Still, she did much to bring before the public a clear understanding of the nature of the West African countries, for which, in spite of their many drawbacks, she continued to feel a surprising enthusiasm, her powers of observation and description rendering all she wrote unusually valuable and suggestive, although many might dissent from the particular views which she held. Returning from her second journey in 1895, Miss Kingsley prepared for publication a narrative of her experiences, which appeared in 1897 under the title 'Travels in West Africa.' Two years later she contributed a second volume, in some ways supplementary to the first, entitled 'West African Studies,' in which she treated at length of the fetish question and of various important subjects connected with the development of the West African colonies. The strong opinions which she held as to the government of these, while not perhaps likely to meet with general acceptance, have yet been of service in directing attention to an important subject.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1899-1900.

Anniversary Meeting, May 21, 1900.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S.,
President, in the Chair.

THE Secretary read the minutes of the last Anniversary Meeting.

ELECTIONS.—Wm. Belcher; Bertie Sadler Brockbank; Hy. Cawood Embleton; Morris N. Fuller; Sir Robert Grenville Harvey; Athole Burnett Reader; Alexander Richardson; Herbert Shaw; D. M. M. Crichton Somerville; Edward A. Reeves, Map Curator R.G.S.

The presentation of the awards for the year then took place.

THE PRESIDENT, addressing Captain H. H. P. Deasy, said: Captain Deasy, your admirable survey and exploring work while facing very great difficulties, hardships, and dangers, has won for you the highest honour that this Society has in its power to bestow. I think I know as well, or perhaps better, than most men what your difficulties were. They were not entirely confined to the physical aspects of the country, although these were difficult enough, but you had much to contend against in obstruction, perhaps not only from Chinese people, and in other ways. But, in spite of all these difficulties, you succeeded in exploring an entirely unknown part of Central Asia, and in mapping that country scientifically; so that your work has obtained the entire approbation of the Indian Survey Department. You have thus performed a great geographical feat; you have done very valuable geographical and, I believe, also political work. We cannot forget that you are a pupil of this Society, a very diligent pupil of Mr. Coles, and that you have done our Society great credit. I have very great pleasure in placing in your hands the Founder's Gold Medal.

Captain DEASY: Permit me to express my heartfelt thanks to you, Sir, and to the Council of this distinguished Society, for the great honour bestowed upon me in the bestowal of the Founder's medal, an honour which I highly value, as a mark of your appreciation of the work accomplished by me during the last four years in Central Asia, often in exceedingly difficult parts of the country. I rejoice also to have an opportunity of recording my grateful sense of the grant voted to me by this Society, after the examination of the maps made during my first journey, as also for

the valuable assistance afforded me at all times by you, sir, the Council, and the officers of this Society. I would especially associate with your name, Sir Clements Markham, those of Sir Thomas Holdich, Dr. Keltie, Mr. Coles, and Mr. Reeves, to whom are due my sincere thanks for the encouragement and assistance which mainly conduced to the success of my efforts. I need hardly add that no honour is more highly esteemed by explorers than that which you have conferred upon me, as it is well known that the awards of the Royal Geographical Society are conferred with absolute impartiality, irrespective of nationality, politics, or creed. The news of your grant reached me months after its bestowal, at a most opportune moment, when resting in Yarkhand after three unsuccessful attempts to explore in Sarikol. I was depressed; until then my work had not received the slightest recognition from the Indian Government; but this pecuniary help re-awakened my enthusiasm. I at once determined to prolong my journey for another year and make a fourth attempt to penetrate that very difficult part of Chinese Turkistan, the district of the Yarkhand river and the adjacent country. The bestowal of this honour upon me acts, and will act, as a powerful incentive to resume exploration as soon as my health is sufficiently re-established as to give me a fair chance of facing the severity of the climate of a country a very large area of which is of a greater altitude than Mont Blanc. Once more let me thank you sincerely for this mark of appreciation.

THE PRESIDENT: Mr. James McCarthy has been for many years engaged in a survey of Siam. He has explored districts never before visited by Europeans; he has organized an efficient staff of surveyors; he has worked under circumstances of very great difficulty and danger. In looking at his memoir, I thought the dedication very pathetic: it was to his two English colleagues who had both fallen victims to their duty. The one was murdered by savage tribes, the other died of disease. But in spite of these difficulties Mr. McCarthy has at length completed his survey, the result of which is the first scientific map of Siam, a very valuable piece of geographical work, which not only does great credit to him, but also to the enlightened Government of Siam, which has employed him and furnished him with the necessary means. I place the Patron's Medal in the hands of Mr. McCarthy's friend, Mr. Warrington Smyth, and he will kindly hand it to Mrs. McCarthy, who I see is present.

MR. WARRINGTON SMYTH: The Siamese minister, who intended to be here to receive the medal, but who is, unfortunately, unable to be present, desired me to express his regret, and at the same time his appreciation of the fact that this award should have been given to a servant of the Siamese Government; he feels it as a mark of honour to the Government which instituted the work, and as a compliment to his Majesty the king, who has taken a personal interest in the survey. It is a great pleasure to see Mrs. McCarthy back again from Siam, and to answer for my old friend and comrade, Mr. McCarthy. I know well that he has had to face great difficulties for many years, working with no encouragement; in fact, he was campaigning without the glory, and I am pleased to think that now he has won somewhat of the latter.

THE PRESIDENT: Mr. Arctowski, for your excellent meteorological and oceanographical work in the Belgian antarctic expedition, our Council has awarded you the Murchison Grant. I watched your expedition from the first, and when I visited your commander, M. Gerlache, at Sandifjord, I discussed the various questions with him, and went over the *Belgica* with the greatest interest. I think that he displayed great energy in getting up his expedition with such small means. I well recollect, before you started, your coming to me and discussing the subject, when I had the great pleasure of making your acquaintance. At that time your expedition was the only one about to start for the antarctic regions. It has done

useful service to science, and you, by your soundings and meteorological observations, have performed very valuable geographical work.

Mr. Vaughan Cornish, when an able and accomplished geographer takes up one particular department of our science, and studies it with care during a series of years, he is sure to do extremely valuable work. This you have done by bringing your knowledge and your trained habit of observation to bear on questions as to the formation of sand-dunes and seabeaches; I may even say that you have founded a new department of our science, the department of kumatology. For these services the Council resolved to award you the Gill Memorial, which I beg to present to you.

The Council have had great pleasure in according to Mr. Robert Codrington, for his journey from Tanganyika to the Nyasa, the Back Memorial. Mr. Codrington was also asked to obtain, and has obtained with great trouble, that memento of Dr. Livingstone, the section of the tree under which the doctor's heart was buried, and arranged for it to be forwarded to this country.

Mr. A. T. Alldridge has done a great deal of work in the colony of Sierra Leone, and has been awarded the Outhbert Peek Grant.

The President then delivered his Anniversary Address (see p. 1).

Visitors then withdrew, and, the President having appointed Captain Stiffe and Mr. Wm. Corner scrutineers, the election of the Council for the ensuing year was proceeded with. The honorary secretary, Major Darwin, read the report of the Council for 1899; this will be published in the Year-book for 1901.

The President then announced that the Council, as proposed, had been elected. The list is as follows, the names of new members, or those who change office, being printed in *italics* :—

President: Sir Clements Markham, K.C.B., F.R.S., F.S.A. *Vice-Presidents*: Hon. G. C. Brodrick; Right Hon. Sir George D. Taubman Goldie, K.C.M.G.; Colonel Sir Thomas Hungerford Holdich, R.E., K.C.I.E., C.B.; *Admiral Sir Anthony H. Hoskins*, G.C.B.; *Admiral Sir F. Leopold McClintock*, K.C.B., D.C.L., F.R.S.; General Sir Charles W. Wilson, R.E., K.C.B., K.C.M.G. *Treasurer*: Edward L. Somers Cocks. *Trustees*: Right Hon. Lord Avebury, F.R.S.; Sir Outhbert E. Peek, Bart., F.R.A.S., F.S.A. *Honorary Secretaries*: Major Leonard Darwin, R.E.; James F. Hughes. *Foreign Secretary*: Sir John Kirk, K.C.B., G.C.M.G., F.R.S. *Councillors*: *Major-General Sir John C. Ardagh*, K.C.I.E., C.B.; Sir H. E. G. Bulwer, G.C.M.G.; W. T. Blanford, LL.D., F.R.S.; Colonel George Earl Church; Clinton T. Dent; *Major-General Sir Francis W. De Winton*, R.A., G.C.M.G., C.B.; *Admiral Sir R. Vesey Hamilton*, G.C.B.; *Colonel D. A. Johnston*, R.E.; Colonel Augustus Le Mesurier, R.E., C.I.E.; *L. W. Longstaff*; George S. Mackenzie, C.B.; *Admiral A. H. Markham*; *A. P. Maudslay*; Duke of Northumberland, K.G.; Sir George S. Robertson, K.C.S.I.; Howard Saunders, F.L.S.; *General Sir Henry A. Smyth*, K.C.M.G.; Herbert Warington Smyth; Lord Stanmore, G.C.M.G.; Colonel Charles Moore Watson, R.E., C.M.G.; *Admiral Sir W. J. L. Wharton*, K.C.B., F.R.S.

THE ANNIVERSARY DINNER.

In the evening the anniversary dinner took place at the Hôtel Métropole. The President, Sir Clements Markham, was in the chair, and among those who were present as guests were the Lord Chief Justice of England, the Vice-Chancellor of the University of Oxford, Captain H. H. P. Deasy, Mr. James Bryce, M.P., Sir W. Phillimore, Admiral Sir William Graham, Sir George Kekewich, the Hon. J. R. Dickson, General Sir John Ardagh, Sir Michael Foster, M.P., Sir John Cockburn, Sir Sidney Shippard, Sir Horace Tozer, Prof. Rücker, Sir Archibald Geikie, the Headmaster of Westminster School, Lieutenant Robert Scott, R.N., Mr. T. Leslie Cartwright, Prof. Pelham, M. Arctowski, and Sir R. Douglas Powell.

The PRESIDENT, after proposing the loyal toasts, next gave that of "The Navy and Army," for which Admiral the Hon. W. J. WARD and General Sir HENRY NORMAN responded.

The toast of "The Medallists" was also proposed by the PRESIDENT.

Captain DEASY said he felt that the absence of Mr. McCarthy was to be much regretted, the more so because he could not but be conscious of the fact that his lengthened services in Siam had added considerably more to the advancement of geographical science than his own had done. For himself, he was deeply sensible of the great honour conferred upon him by the Royal Geographical Society by its award of the Founder's Gold Medal. At no distant date Tibet would attract, and deservedly attract, in large measure the attention of the scientific and political world. It was earnestly to be hoped that in the near future the Indian Government would see its way to grant substantial assistance to competent explorers in Tibet, and not leave everything, or almost everything, as now, to private enterprise. In conclusion, he paid a high tribute to the assistance rendered to him by the Royal Geographical Society, but for whose aid he could not have achieved the results at which he had arrived. He also desired to acknowledge the help afforded to him by the officials of the Indian Government acting in their private capacity.

The Hon. G. C. BRODRICK proposed "Our Guests," to which the Lord Chief Justice and the Vice-Chancellor of the University of Oxford responded.

Major L. DARWIN proposed "The Sister Societies," coupling with the toast the name of Mr. J. G. Bartholomew (hon. sec. of the Royal Scottish Geographical Society), and the toast of "The President" was subsequently proposed by Sir MICHAEL FOSTER, M.P.

Thirteenth Ordinary Meeting, June 18, 1900.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*John Alexander; William Henry Cook; James Stokes.*

The Paper read was :—

"King Menelek's Dominions and the Country between Lake Gallop (Rudolf) and the Nile Valley." By Captain M. S. Wellby.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., LL.D., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full :—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Abh. = Abhandlungen.	Mem. = Memoirs, Mémoires.
Ann. = Annals, Annales, Annalen.	Met. = Meteorological.
B. = Bulletin, Bollettino, Boletim.	P. = Proceedings.
Com. = Commerce.	R. = Royal.
C. Rd. = Comptes Rendus.	Rev. = Review, Revue.
Erdk. = Erdkunde.	S. = Society, Société, Selskab.
G. = Geography, Geographie, Geografia.	Sitzb. = Sitzungsbericht.
Ges. = Gesellschaft.	T. = Transactions.
I. = Institute, Institution.	V. = Verein.
Iz. = Izvestiya.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
k. u. k. = kaiserlich und königlich.	Z. = Zeitschrift.
M. = Mittheilungen.	Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

- Austria.** *Globus* 77 (1900): 290-294. **Rhamm.**
Zur Entwicklung des slavischen Speichers. Von Karl Rhamm. *With Illustrations.*

On the origin of a particular type of granary in Slavonic villages.

Austria—Meteorology.

Jahrbücher der k. k. Central-Anstalt für Meteorologie und Erdmagnetismus. Jahrgang, 1897. Neue Folge xxxiv. Band. Wien: W. Braumüller, 1899. Size 12½ × 9½, pp. xxiv. and 146.

- Austria—Tirol.** *M.G. Ges. Wien* 43 (1900): 25-30.

Diener.

Ueber den Einfluss der Erosion auf die Structur der Südosttirolischen Dolomitstöcke. Von Prof. Dr. C. Diener.

Denmark.

Den Danske Turistforenings Aarskrift 1900. Kjøbenhavn: G. E. C. Gad, 1900. Size 9 × 6, pp. 128. *Illustrations. Presented by the Danish Tourist Club.*

The year-book of the Danish Tourist Club. An article on the "Dänische Nordseeküste," by R. Pallese, in *Globus* 77 (1900): 224-227, reproduces from this year-book pictures of the coast-dunes, and of a steamer which had been sunk and buried in the sand.

Denmark—Meteorology.

Nautical-Meteorological Annual, 1899. Published by the Danish Meteorological Institute. Kjøbenhavn: G. E. C. Gad, 1900. Size 12½ × 9½, pp. xlv. and 200. *Charts and Diagrams. [In Danish and English.] Presented by the Danish Meteorological Institute.*

- Europe.** *P.R. Artillery J.* 27 (1900): 1-22.

Maguire.

The Strategic Geography of Europe at the Accession of Her Majesty Queen Victoria, and in 1899. By T. M. Maguire, LL.D. *With Maps.*

Europe—Anthropology.

Deniker.

Les Races de l'Europe. I. L'Indice Céphalique en Europe. Par J. Deniker.—Association Française pour l'Avancement des Sciences, Congrès de Saint-Étienne. 26^e Session 1897. Paris: Au Secrétariat de l'Association, 1899. Size 10 × 6½, pp. 120. *Map. Presented by the Author.*

The author points out that, classifying the cephalic index of the inhabitants, one can distinguish four regions in Europe—a dolicocephalic region in the north, a more markedly dolicocephalic region in the south, a very brachycephalic region in the centre of western Europe, and a less marked brachycephalic region in the east.

Europe—Anthropology.

Deniker.

Les races de l'Europe. Par J. Deniker. (From *l'Anthropologie*, t. ix. pp. 113-133.) Size 10 × 6½. *Map. Presented by the Author.*

- Europe—Anthropology.** *Globus* 77 (1900): 217-220.

Schmidt.

Die Verteilung der Kopfformen in Europa. Von Emil Schmidt. *With Map.*

The map shows in colours the prevalence of certain ranges of value of the cranial index in Europe.

- Europe—Early Metallurgy.** *Archæologia* 56 (1899): 267-322.

Gowland.

The Early Metallurgy of Copper, Tin, and Iron in Europe, as illustrated by Ancient Remains and the Primitive Processes surviving in Japan. By W. Gowland. *With Illustrations.*

- France.** *B.S. Languedoc. G.* 22 (1899): 122-136, 239-277.

Gros.

La Salvétat et ses environs. Par M. G. Gros. *With Illustrations.*

France—Chamonix.

Whympers.

Chamonix and the Range of Mont Blanc. A Guide. By Edward Whympers. Fifth edition. London: John Murray, 1900. Size 7½ × 5, pp. xiv. and 206. *Maps and Illustrations. Price 3s. net. Presented by the Author.*

- France—Floods.** *B.S. Languedoc. G. 22* (1899): 79-106, 185-215. **Duponchel.**
Les inondations et la charité collective. Par M. A. Duponchel.

On the inundations in different parts of France, with suggestions for reducing the risk of damage from floods.

- France—Gard.** *B.S. Languedoc. G. 22* (1899): 107-121. **Rouville.**
Une station géologique, archéologique et médicale: Les Fumades (près Alais, Gard).
Par P. G. de Rouville.

Description and history of the locality of the mineral springs of Alais.

- France—Normandy.** **Dearmer.**
Highways and Byways in Normandy. By Percy Dearmer, M.A. With Illustrations by Joseph Pennell. London: Macmillan & Co., 1900. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. xiv. and 368. *Map. Price 6s. Presented by the Publishers.*

The description of a cycling tour in Normandy, or rather of the interesting places which were visited, the historical point of view predominating. The illustrations are from sketches; the map shows the route.

- France—Place Names.** *B.S.G. de l'Est* (1899): 111-120, 235-242. **Fournier.**
Des noms de lieux ayant pour racine les noms du dieu Belen, Bel. Par A. Fournier.

- France and Belgium.** **Gosselet.**

B. Union G. Nord de la France 20 (1899): 98-142, 193-256.

Géographie physique du Nord de la France et de la Belgique. Par J. Gosselet.

The physical geography of Flanders is considered under the head of eight provinces or districts.

- Germany—Prussia.** **Hellmann.**
Regenkarte der Provinz Ostpreussen. Mit erläuterndem Text und Tabellen. In amtlichen Auftrage bearbeitet von Professor Dr. G. Hellmann. Berlin: D. Reimer (Ernst Vohsen), 1900. Size $10\frac{1}{2} \times 7$, pp. 26. *Map. Price 1 m. Presented by the Publisher.*

Contains statistics of ten years' rainfall in East Prussia, with a map of the mean annual rainfall in the province.

- Rumania.** *C. Rd. 129* (1899): 894-897. **Martonne.**
Sur la période glaciaire dans les Karpates méridionales. Note de M. E. de Martonne.

- Rumania.** *C. Rd. 130* (1900): 932-935. **Martonne and Murgoci.**
Sondage et analyse des boues du lac Galcescu (Karpates méridionales). Note de MM. de Martonne et Munteanu Murgoci.

This small lake, which has not hitherto appeared on any map, is situated in the Transylvanian Alps, and occupies a typical glacial cirque.

- Russia—Finland.** *Meddelanden G. Fören. Finland 5* (1899-1900), (6): 1-86. **Rosberg.**
Sääksmäki Socken. Utkast till en geografisk sockenbeskrifning. Af J. E. Rosberg. *Plate.*

The author recalls the fact that a century, and even two centuries, ago many descriptions of parishes in Finland were presented to the Finnish University in Åbo as theses. Originally essentially geographical, these theses have become during the nineteenth century more and more historical. With the object of once more calling attention to the geographical value of these exercises, the author has prepared this detailed account of the parish of Sääksmäki, to which he appends a German abstract of four pages.

- Russia—Railways.** **Cooke.**
Russian Railways. Foreign Office, Miscellaneous No. 522, 1900. Size $10 \times 6\frac{1}{2}$, pp. 8. *Price ½d.*

On the length of Russian railways open and under construction in 1889 and in 1899, and on the new projects for railways in European Russia.

- Scandinavia.** *G.Z. 6* (1900): 129-139. **Kerp.**
Der Einfluss der Eiszeit auf das Natur- und Kulturbild der skandinavischen Länder. Nach Reisebeobachtungen. Von Heinrich Kerp. *With Illustration.*

- Scandinavia—People.** *Ymer 20* (1900): 25-49. **Arbo.**
Er der foregået nye invandringer i Norden? Forsøg på en anthropologisk besvarelse. Af C. O. E. Arbo. [French abstract.] *With Maps and Diagrams.*

An anthropological study as the result of which the author finds reasons to believe

that in every archaeological period new cranial forms, previously unknown, made their appearance. He also adduces historical reasons for believing in the occurrence of successive immigrations into Scandinavia.

Spain. *B.S. Languedoc. G. 22* (1899): 216-238. **Viala.**

Un voyage en Espagne. Par L. Fernand Viala.

A recent summer journey by a mining engineer in the south of Spain.

Sweden. **Andersson.**

Physische Geographie von Schweden, in ihren Hauptzügen dargestellt von Gunnar Andersson. (Sonderdruck aus "Schweden, Reisehandbuch herausgegeben von Schwedischen Touristenverein." 2 Aufl. Stockholm, 1900.) Size $7 \times 4\frac{1}{2}$, pp. 12. *Maps. Presented by the Author.*

A summary of this compact memoir is given in *Globus* 77 (1900): 272-276.

Sweden—Tourist Year-book.

Svenska Turistföreningens Årsskrift för År 1900. Stockholm: Wahlström & Widstrand. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. viii. and 422. *Map and Illustrations. Presented by the Svenska Turistföreningen.*

The annual publication of the Swedish Tourists' Club, the object of which is to popularize Sweden as a holiday resort.

Switzerland. *B.S. Neuchâtel. G. 12* (1900): 66-218. **Pittard.**

Anthropologie de la Suisse. Étude de plusieurs séries de crânes anciens provenant de diverses régions de la vallée du Rhône (Valais). Par Eugène Pittard.

Switzerland. *B.S. Neuchâtel. G. 12* (1900): 37-65. **Schenk.**

L'Ethnogenie des populations helvétiques. Par le Dr. Alexandre Schenk.

A study of the origin of the Swiss people, mainly from craniometric observations.

Switzerland—Ticino Valley. *Appalachia 9* (1900): 136-156. **Davis.**

Glacial Erosion in the Valley of the Ticino. By W. M. Davis. *With Illustrations.*

Prof. Davis was struck with the fact that the lateral valleys of the Alps were out of adjustment with the main valleys into which they flow, and he attributes this condition to the influence of glacial erosion in the main valleys.

Switzerland—Zermatt. **Whymper.**

The Valley of Zermatt and the Matterhorn. A Guide. By Edward Whymper.

Fourth edition. London: John Murray, 1900. Size $7\frac{1}{2} \times 5$, pp. xiv. and 224.

Maps and Illustrations. Price 3s. net. Presented by the Author.

United Kingdom. *J.R. Agricultural S. 11* (1900): 19-34. **Crawford.**

The Food Supply of the United Kingdom. By R. F. Crawford.

United Kingdom—Earthquakes. *Geolog. Mag. 7* (1900): 106-115, 164-177. **Davison.**

On some Minor British Earthquakes of the Years 1893-1899. By Charles Davison, sc.d. *With Diagrams.*

United Kingdom—England. *P.S. Antiquaries 17* (1898-99): 221-224. **Hope.**

Notes on the Walls of Southampton, and recent proceedings relating thereto. By W. H. St. John Hope. *With Plan.*

United Kingdom—Rainfall. **Scott.**

The Diurnal Range of Rain, at the Seven Observatories in connection with the Meteorological Office, 1871-1890. By Robert H. Scott, d.sc., f.r.s. London: Eyre & Spottiswoode, 1900. Size $10 \times 6\frac{1}{2}$, pp. 40. *Diagrams. Price 2s. 6d. Presented by the Meteorological Office.*

A statement of the mean hourly rainfall at seven meteorological stations for a period of twenty years.

United Kingdom—Scotland. *Scottish G. Mag. 16* (1900): 193-235. **Murray and Pullar.**

A Bathymetrical Survey of the Fresh-water Lochs of Scotland. By Sir John Murray, k.c.b., d.sc., etc., and Fred. P. Pullar. *With Maps and Illustrations.*

This paper was also published in the *Geographical Journal* for April, pp. 309-352.

ASIA.

Asia—East and Central.

Obrucheff.

Central Asia, Northern China, and the Nan Shan. Report of expeditions carried out for the Imperial Russian Geographical Society in 1892-94. By V. A. Obrucheff.

Vol. i.—Journey through Eastern Mongolia, Chi-li, Shan-si, Shen-si, and Kan-su, Ordos, Alashan, and Eastern Nan Shan. (Edited for the Imperial Russian Geographical Society by J. V. Mushketoff.) [In Russian.] St. Petersburg: Printed by M. M. Stasyulevich, 1900. Size $12\frac{1}{2} \times 9$, pp. xxxviii. and 630. *Maps and Illustrations.* Presented by the Imperial Russian Geographical Society.

China. *Petermanns M.* 46 (1900): 12-18. **Bretschneider.**

Potanins letzte Reise in West-China und im osttibetanischen Grenzgebiete im Jahre 1893. Mit Anmerkungen von Dr. E. Bretschneider. *With Map.*

Notes and criticism of Potanin's journey in Sechuan and on the borders of Tibet in 1893.

China. *Deutsche Rundschau G.* 22 (1900): 337-347. **Köhler.**

Kritische Studien zur Bevölkerungsfrage Chinas. Von E. M. Köhler.

The total population of the Chinese empire is here estimated at 450,000,000.

China. *La G., B.S.G. Paris* (1900): 267-288. **Leclère.**

Géographie générale des provinces Chinoises voisines du Tonkin. Par M. A.

Leclère. *With Illustrations.*

China. *Rev. G.* 45 (1899): 347, 418; 46 (1900): 25, 107. **Barré.**

La Chine entr'ouverte. Sa perfectibilité. Par M. Paul Barré.

China. *B.S. d'Études Colon.* 7 (1900): 1-23, 71-100. **Leval.**

La Chine d'après des auteurs récents. Par M. G. de Leval. *With Illustrations.*

A resumé of recent writings on the resources of China and the prospects for European trade.

China. *J. United Service I. India* 29 (1900): 1-28. **Wingate.**

"Things Chinese." With a short account of a journey through the Heart of China. By Captain A. W. S. Wingate. *With Map and Sections.*

The journey referred to was described in the *Geographical Journal*, vol. xiv. (1899), p. 639.

China—Anthropology. **Talko-Hryniewicz.**

Travaux de la Sous-Section Troitzkossawsk-Kiakhta Séction du pays d'Amour de la Société Imperiale Russe de Géographie. Tome ii., Livraison 3, 1899. Notes sur l'Anthropologie des Chinois du Nord. Les Chinois de Maimatchen de Kiakhta et d'Ourga. Par J. de Talko-Hryniewicz. (In Russian.) Moscow, 1899. Size 10×7 , pp. 82. *Illustrations.*

China—Chekiang. **Werner.**

Trade of Hangchow for the year 1898. Foreign Office, Annual No. 2377, 1900. Size 10×6 , pp. 10. *Price 1d.*

China—Chekiang. **Wilkinson.**

Trade of Ningpo for the year 1899. Foreign Office, Annual No. 2421, 1900. Size 10×6 , pp. 10. *Price 1d.*

China—Manchuria. **Hosie.**

Trade of Newchwang for the year 1898. Foreign Office, Annual No. 2369, 1899. Size 10×6 , pp. 18. *Price 1½d.*

This report contains a short account of the Manchurian railway.

China—Manchuria. *Imp. and Asiatic Quarterly Rev.* 9 (1900): 287-313. **Parker.**

Russia's Sphere of Influence; or, a Thousand Years of Manchuria. By E. H. Parker.

Eastern Asia—Typhoons. *Meteorolog. Z.* 17 (1900): 71-74. **Bergholz.**

Ueber Bildungsstätten, Bahnen, und Zonen der Orkane des "Fernen Ostens." Von Paul Bergholz.

French Indo-China. **Lagrillière-Beaulerc.**

A travers l'Indo-Chine, Cochinchine, Cambodge, Annam, Tonkin, Laos. Par Eug. Lagrillière-Beaulerc. Paris: Ch. Tallandier [1900]. Size $10 \times 6\frac{1}{2}$, pp. viii. and 252. *Map and Illustrations.* *Price 6 fr.*

This description of French Indo-China and of its several provinces is the result of a visit to the country in order to study its condition, at the instance of the French Colonial Office.

French Indo-China—Tonkin. *Rec. Maritime* 144 (1900): 5-66. **Lhomme.**

A travers le Tonkin: La rivière Claire. Par M. G. Lhomme. *With Maps.*

- India.** *J.R. Asiatic S.* (1900): 261-291. **Baden-Powell.**
The Villages of Goa in the Early Sixteenth Century. By B. H. Baden-Powell.
Particulars taken from an official Portuguese charter in 1526.
- India—Assam.**
Report on the Administration of the Province of Assam for the year 1898-99. Shillong, 1899. Size $13 \times 8\frac{1}{2}$, pp. xvi, 210, and cccvi. *Maps.*
- India—N.-W. Frontier.** **Hoghton.**
Operations of the Mohmand Field Force in 1897. Compiled . . . by Captain F. A. Hoghton. Simla, 1899. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. vi. and 82. *Maps.*
- India—N.-W. Frontier.** **Kemball.**
Operations of the Tochi Field Force in 1897-98. Compiled . . . by Major G. V. Kemball. Simla, 1900. Size $13 \times 8\frac{1}{2}$, pp. iv. and 78. *Maps and Plate.*
- India—N.-W. Provinces and Oudh.**
Report on the Administration of the N.-W. Provinces and Oudh, for the year ending 31st March, 1899. Allahabad, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. iv., xl, 198, and 200.
- India—Punjab.**
Report on the Administration of the Punjab and its Dependencies for 1898-99. Lahore. Size $13 \times 8\frac{1}{2}$, pp. xiv., 280, and ccxlii. *Map and Diagram.*
- Malay Archipelago—Java.** **Wit.**
Facts and Fancies about Java. By Augustade Wit. Second edition. The Hague, W. P. Van Stockum & Son; London: Luzac & Co. 1900. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 266. *Illustrations.* Price 7s. 6d. net. Presented by the Publishers.
Pleasantly written sketches of life, both Dutch and native, in Batavia, Buitenzorg, and other parts of Java.
- Malay Archipelago—Sumatra.** **Hasselt.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 67-93.
De inlijving der V. Kota-Kampar. Door A. L. van Hasselt. *With Map.*
On the new Dutch district of Kota Kampar, which was established in September, 1899, on the Kampar river.
- Malay Archipelago—Sumatra.** **Pleyte.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 1-48.
Herinneringen uit Oost-Indië, Soematra's Westkust. Door C. M. Pleyte.
Describes a visit to Baros *via* Poelau Telo.
- Persia—Lake Urmi.** **Günther and Manley.**
On the waters of the Salt Lake of Urmi. By R. T. Günther, M.A., and J. J. Manley. (From the *Proceedings of the Royal Society*, vol. 65.) Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. [8.] Presented by R. T. Günther, Esq.
Analyses of two samples of water from the salt lake Urmi, the most remarkable feature of which appears to be the absence of carbonates and silicates from the dissolved salts, which seem to be entirely chlorides and sulphates.
- Persia and Afghanistan.** *Nineteenth Century* 47 (1900): 413-424. **Gordon.**
The Problem of the Middle East. By General Sir Thomas Gordon, K.C.I.E.
- Russia—Caucasus.** **Raddle.**
Grundzüge der Pflanzenverbreitung in den Kaukasusländern von der unteren Wolga über den Manytsch-Scheider bis zur Scheitelfläche Hocharmeniens. Von Dr. Gustav Radde.—Die Vegetation der Erde. Sammlung pflanzengeographischer Monographien herausgegeben von A. Engler und O. Drude. III. Leipzig: W. Engelmann, 1899. Size $10\frac{1}{2} \times 7$, pp. xii. and 500. *Maps and Illustrations.* Price 23s.
- Russia—Central Asia.** *Ann. G.* 9 (1900): 119-140. **Saint-Yves.**
Dans le Tian Chan Russe. Second article. De l'Issyk Koul au Ferghana. Par M. G. Saint-Yves. *With Illustrations.*
- Russia—Pamirs.** *Verh. Ges. Erdk. Berlin* 27 (1900): 134-150. **Olufsen.**
Herr Oberleutnant O. Olufsen: Die zweite Dänische Pamir-Expedition. *With Map.*
A journey through the Russian Pamir, including Shignan and Roshan in 1898-99.

- Turkey—Palestine.** *B.S.G. Genève* 39 (1900): 19-27. **Neville.**
 Jérusalem ancienne. Par M. Th. Neville. *With Plan.*
- Turkey—Yezidis.** *B.S. Neuchatel. G. 12* (1900): 275-301. **Spiro.**
 Les Yezidi ou les adorateurs du Diable. Par Jean Spiro. *With Map.*
 Describes the sect of Yezidis, with a sketch-map showing the distribution of the groups of these people which now exist.
- Western Asia—Historical.** *B.S. Neuchatel. G. 12* (1900): 261-274. **Reclus.**
 La Phénicie et les Phéniciens. Par Elisée Reclus. *With Map.*

AFRICA.

- Abyssinia.** **Blundell.**
 A Journey through Abyssinia to the Nile. By Herbert Weld Blundell. (From the *Geographical Journal* for February and March, 1900.) Size 10 × 6½, pp. 34. *Map and Illustrations.*
- African Travel.** **Foa.**
 De l'Océan Indien à l'Océan Atlantique. La traversée de l'Afrique du Zambèze au Congo Français. Par Édouard Foa. Paris: Plon-Nourrit et Co, 1900. Size 7½ × 5, pp. xii. and 324. *Map and Illustrations.* Price 4 fr. *Presented by the Publishers.*
 This volume describes the author's journey from the Zambezi, through the region west of Lake Nyasa, and finally by Lake Tanganyika and the Congo to the sea, carried out between 1894 and 1897.
- Basutoland.**
 Basutoland. Report for 1898-9. Colonial Reports, Annual No. 288, 1900. Size 10 × 6½, pp. 56. Price 3d.
- Basutoland.** *T. Liverpool G.S.* (1899): 30-35. **Fairelough.**
 Expedition to the Mont Aux Sources, Basutoland. Communication from T. Lindsay Fairelough.
- British East Africa—Mount Kenya.** **Mackinder.**
 A Journey to the Summit of Mount Kenya, British East Africa. By H. J. Mackinder, M.A. (From the *Geographical Journal* for May, 1900.) Size 10 × 6½, pp. 34. *Maps and Illustrations.*
- Central Africa.** **Codrington.**
 A Journey from Fort Jameson to Old Chitambo and the Tanganyika Plateau. By Robert Codrington. (From the *Geographical Journal* for March, 1900.) Size 10 × 6½, pp. 8. *Map.*
- Egypt.** **Boddy.**
 From the Egyptian Ramleh: Sketches of Delta Life and Scenes in Lower Egypt. By the Rev. Alexander A. Boddy. London: Gay & Bird, [1900]. Size 8½ × 5½, pp. xvi. and 440. *Map and Illustrations.* Price 7s. 6d. net. *Presented by the Author.*
 A personal record of a residence in Lower Egypt, with a large number of "snapshot" photographs, giving an intimate idea of the author's everyday life in Egypt.
- Egypt—The Senussi.** *Nineteenth Century* 47 (1900): 400-412. **Threlfall.**
 Senussi and his threatened Holy War: a Warning. By T. R. Threlfall.
 Account of the origin of the Senussi sect, and forecast of the probable schemes of the present leader.
- Ivory Coast.** *Ann. G.* 9 (1900): 159-172. **Thomasset.**
 La Côte d'Ivoire. Par le Capitaine Thomasset, de la mission Houdaille. *With Maps.*
- Nigeria—Lower Nigeria.** **Moor.**
 Niger Coast Protectorate. Report for 1898-9. Colonial Reports, Annual No. 289, 1900. Size 10 × 6, pp. 34. Price 2½d.
 It is noted incidentally in this Report that the Europeans who stand the climate of the Niger coast best, are those of the fair type with sound teeth and not under twenty-two years of age.
- Portuguese East Africa.** *B.S. Neuchatel. G. 12* (1900): 306-315. **Grandjean.**
 Le bassin du Nkomati et sa communication avec le Limpopo. Par A. Grandjean. *With Map.*

- Portuguese East Africa.** *B.S. Neuchatel. G.* 12 (1900): 316-341. **Grandjean.**
 La cartographie de la province de Lourenço Marques. Par A. Grandjean.
Portuguese East Africa—Delagoa Bay. *Ann. Hydrographie* 28 (1900): 151-160. —
 Die Delagoa-Bucht.

- South Africa—Bibliography.** **Cotgreave.**
 The Transvaal and South Africa. A Collection of References to Books containing articles on the above subject which appear in Cotgreave's "Contents-Subject Index to General and Periodical Literature," together with a list of special works dealing with South African Affairs. London: West Ham Public Libraries, 1900. Size 7 x 5, pp. 12. *Presented by the Compiler.*

- South Africa—Boers.** *Rev. Scientifique* 13 (1900): 299-306. **Fournier de Flaix.**
 Les premiers Boers. Par M. E. Fournier de Flaix.
 An account of the formation of the Boer race by the successive colonization of South Africa by the Dutch and French.

NORTH AMERICA.

Alaska.

The Russian-American Mining and Exploration Company, Alaska Territory, 1900. Size 10 x 7, pp. [24]. *Map.*

- Bermuda.** *American J. Sci.* 9 (1900): 313-340. **Verrill.**
 Notes on the Geology of the Bermudas. By A. E. Verrill. *With Map and Illustrations.*

- Canada—Bay of Fundy.** *Ann. Hydrographie* 28 (1900): 181-186. **Schott.**
 Sprungwelle und Fluthgrösse im oberen Theil der Fundy-Bai. Nach einem Kanadischen Amtlichen Bericht bearbeitet von Dr. G. Schott. *With Map.*

- Canada—British Columbia.** **Monckton.**
 Mining Districts near Kamloops Lake, British Columbia. A paper read before the Institution of Mining Engineers. By G. F. Monckton. Annual General Meeting at Sheffield, September 19, 1899. Excerpt from the Transactions of the Institution of Mining Engineers. London and Newcastle-upon-Tyne: A. Reid & Co., 1899. Size 10 x 6½, pp. 18. *Sketch-map, Plan, and Illustrations. Presented by the Secretary of the Institution.*

- Canada—British Columbia.** *Appalachia* 9 (1900): 156-165. **Vaux.**
 The Great Glacier of the Illicilliwaet. By George and William S. Vaux, Jr. *With Map and Plate.*

Records a series of careful measurements as to rate of flow, recession, and change in appearance of the famous glacier at Glacier station, on the Canadian Pacific Railway.

- Canada—Nova Scotia—Tides.** **Dawson.**
 Illustrations of remarkable Secondary Tidal Undulations in January, 1899, as registered on recording Tide Gauges in the region of Nova Scotia. By W. Bell Dawson. (From the *Transactions of the Royal Society of Canada*, Second Series, 1899-1900, vol. v., Section III. Mathematical, Chemical, and Physical Sciences.) Ottawa: J. Hope & Sons, 1899. Size 10 x 7, pp. [4]. *Diagrams.*

- Canada—Quebec.** *P.I. Civil Engineers* 139 (1900): 286-292. **Pilkington.**
 On Methods adopted in carrying out Dock and Harbour Works at Quebec, with description of the Plant employed. By Woodford Pilkington. *With Plans.*

- Canada—Yukon Territory.** *National G. Mag.* 11 (1900): 113-117. **Gorman.**
 Ice-Cliffs on White River, Yukon Territory. By Martin W. Gorman.

The occurrence of occasional cliffs of ice on the White river suggests to the author that they are the remains of buried glaciers through which the river has only recently out its way.

- United States.** *Miss. Catholiques* 32 (1900): No. 1615. —

Mission Catholiques aux États-Unis. (*Map.*)

This map shows the Roman Catholic mission districts and stations.

- United States.** *Petermanns M.* 46 (1900): 73-77. **Preston.**
 Geodätische Arbeiten in den Vereinigten Staaten. Von Erasmus D. Preston. *With Map.*

United States—California.**McAdie and Willson.**

The Climate of San Francisco, California. Prepared . . . by Alexander G. McAdie and George H. Willson.—U.S. Department of Agriculture, Weather Bureau. Bulletin No. 28. Washington, 1899. Size $9\frac{1}{2} \times 6$, pp. 30. *Diagrams. Presented by the U.S. Department of Agriculture, Weather Bureau.*

The mean annual temperature for twenty-eight years was $56^{\circ}2$, the mean for January $50^{\circ}1$ (the minimum), and the mean for every month from June to October inclusive did not differ by more than one degree from 60° , the maximum being $60^{\circ}9$ in September. The absolute maximum ever known was 100° , the absolute minimum 29° . The mean annual rainfall is 23 inches, of which only 4 inches fall between April and October inclusive, and about 5 inches each in December and January.

United States—Coast and Geodetic Survey.**Preston.**

Terrestrial Magnetism 5 (1900): 17-28.

The United States Coast and Geodetic Survey: its origin, development, and present status. By E. D. Preston. *With Illustration.*

United States—Coasts.**Carter.**

Coastal Topography of the United States. By Prof. Oscar C. S. Carter. (From *Proceedings of the Engineers' Club of Philadelphia*, vol. xvi., No. 5, October, 1899.) Size $9 \times 6\frac{1}{2}$, pp. 273-300. *Illustrations. Presented by the Author.*

United States—Minnesota.

The Geological and Natural History Survey of Minnesota. The Twenty-fourth (and final) Annual Report for the Years 1895-1898. Minneapolis, 1899. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. xxviii. and 284. *Presented by the Survey.*

This report completes the work of the Geological Survey of Minnesota, a work on which Prof. Winchell has been engaged since 1872 under many difficulties, and which he now lays down "with thankfulness to all who have aided him and charity for all who have opposed him."

CENTRAL AND SOUTH AMERICA.**Argentine Republic.****Quevedo.**

Tesoro de Catamarqueñismos, nombres de Lugar y apellidos Indios con etimologías y eslabones aislados de la lengua Cacana. Por Samuel A. Lafone Quevedo, m.a. Buenos Aires, 1898. Size $10\frac{1}{2} \times 7$, pp. xlv. and 380. *Presented by the Author.*

Argentine Republic.**Quevedo**

Progresos de la Etnología en el Río de la Plata durante el Año 1898. Por S. A. Lafone Quevedo, m.a. Buenos Aires, 1899. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. 64. *Maps. Presented by the Author.*

Argentine Republic.**Quevedo.**

El Barco y Santiago del Estero. Estudio histórico topográfico. Por S. A. Lafone Quevedo, m.a. Parts i. and ii. Buenos Aires, 1898. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. (part i.) 36; (part ii.) 36. *Maps. Presented by the Author.*

Argentine Republic—Rosario.**Mallet.**

Trade of Rosario for the year 1899. Foreign Office, Annual No. 2422, 1900. Size 10×6 , pp. 8. *Price $\frac{1}{2}$ d.*

Bolivia.

Memoria que presenta el Secretario General de Estado a la Convencion Nacional de 1899. Anexos (Tercera Parte) (pp. 372); Ditto Anexos (Cuarta Parte). La Paz. Size 9×6 .

Particulars as to the various public departments in Bolivia, with voluminous statistics.

Bolivia.**Conway.**

Notes on a Map of part of the Cordillera Real of Bolivia. By Sir Martin Conway. (From the *Geographical Journal* for May, 1900.) Size $10\frac{1}{2} \times 6\frac{1}{2}$, pp. 2. *Map.*

Brazil.

J. Geology 8 (1900): 151-153.

Branner.

Ants as Geologic Agents in the Tropics. By John C. Branner. *With Illustrations.*

On the enormous ant-hills in tropical South America, which not only cover large areas of the country with mounds of clay, but conceal galleries and tunnels penetrating to a great depth even in the hardest soils.

- Brazil.** *B.S. d'Études Colon.* 7 (1900): 245-271. **Guilmot.**
 Ceará et Amazonie. Por D. Guilmot. *With Illustrations.*
- Brazil—Minas Geraes.** **Negri.**
 Lo stato di Minas Geraes nel Brasile. Rapporto del nob. cav. E. Negri.—Bollettino del Ministero degli Affari Esteri, Dicembre, 1899. Roma, 1899. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 24.
 On the condition with regard to agriculture and other industry of the state of Minas Geraes, with particulars as to regulations affecting immigration.
- Brazil—Rio Grande do Sul.** **Lindman.**
 Vegetationen i Rio Grande do Sul (Sydbrasilien). Af C. A. M. Lindman. Stockholm: Nordin & Josephson, 1900. Size 10×7 , pp. x. and 240. *Maps and Illustrations.* Price 5 kr. 50 öre. *Presented by the Royal Academy of Sciences of Stockholm.*
 This volume deals with the varieties of types of vegetation in Rio Grande do Sul; considering not only the species, but their relative abundance, the relation to climate and soil, and the general character and natural divisions of the country.
- British Guiana and Venezuela—Boundary.** **Brenkelman.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 49-66.
 De beslissing in het Britsch Venezuelaansch Grensgeschied. Door Mr. J. B. Brenkelman.
- Jamaica.** **Roxburgh and Ford.**
 The Handbook of Jamaica for 1900: comprising Historical, Statistical, and General Information concerning the Island. Compiled . . . by T. L. Roxburgh and Jos. C. Ford. London: E. Stanford, 1900. Size 9×6 , pp. viii. and 570. *Map.* Price 7s. 6d. *Presented by the Publisher.*
- Nicaragua Canal.** *B.G.S. Philadelphia* 2 (1900): 87-107. **Heilprin.**
 The Nicaragua Canal in its Geographical and Geological relations. By Angelo Heilprin. *With Map and Illustrations.*
- Peru—The Incas** **Quevedo.**
 Los Ojos de Inaymana y el Señor de la Ventana. Por S. A. Lafone Quevedo, M.A. Buenos Aires, 1900. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. 32. *Illustrations.* *Presented by the Author.*
 This memoir is founded on Sir Clements Markham's 'Rites and Laws of the Incas,' one chapter of commentary on which is reproduced in English as an appendix.

AUSTRALASIA AND PACIFIC ISLANDS.

- Australia.**
 Australia. Papers relating to the Federation of the Australian Colonies. London: Eyre & Spottiswoode, 1900. Size $13 \times 8\frac{1}{2}$, pp. iv. and 32. Price 3s. 4d.
 Contains the proposed constitution of the Commonwealth of Australia as approved by the governments of New South Wales, Victoria, Queensland, Tasmania, and South Australia.
- Australia—Discovery.** *B.S.R.G. d'Anvers* 24 (1900): 83-92. **Janssens.**
 La participation des Néerlandais à la découverte de l'Australie, 1606-1765. Notes sur l'ouvrage de M. le Professeur J. E. Heeres. Par M. Ed. Janssens.
- Caroline Islands.** *Deutsches Kolonialblatt* 11 (1900): 100-112. **Bennigsen.**
 Bericht des Kaiserlichen Gouverneurs v. Bennigsen über seine Reise zum Zwecke der Uebernahme des Inselgebietes der Karolinen, Palau und Marianen in deutschen Besitz.
 Official report of the voyage amongst the Caroline, Palau, and Marianne islands to declare the German domination. See *Journal* for June, p. 648.
- German New Guinea.** *M. Deutsch. Schutzgeb.* 13 (1900): 75-85. **Schnee.**
 Bericht des stellvertretenden Gouverneurs Dr. Schnee über eine Fahrt nach der Südküste Neu-Pommerns. *With Sketch-map.*
- Mapia Islands.** *Petermanns M.* 46 (1900): 66-69. **Wichmann.**
 Die Mapia- oder Bunai-Inseln. Von Prof. Dr. Arthur Wichmann.
 This group lies in 1° N., 135° E., and is so little known that the author states that it is not noticed in the English, French, American, or German sailing directions for the Pacific; this, however, is an error, the group being described both in the Admiralty 'Sailing Directions for the Pacific Islands,' and in Findlay's 'North Pacific' under the usual English name of St. Davids or Freewill islands.

New South Wales—Trawling.

Australian Museum, Sydney. Memoir IV. Scientific Results of the Trawling Expedition of H.M.C.S. *Thetis*, off the Coast of New South Wales, in February and March, 1898. Part i.—Published 23rd December, 1899. Sydney: Published by order of the Trustees, 1899. Size $10 \times 6\frac{1}{2}$, pp. 132. *Chart and Plates. Presented by the Australian Museum.*

Queensland—Thursday Island.

Douglas.

Past and Present of Thursday Island and Torres Straits. By the Honourable John Douglas, C.M.G. Brisbane: The Outridge Printing Co., 1900. Size $10 \times 7\frac{1}{2}$, pp. 16. *Illustrations. Presented by the Author.*

An address to the Thursday islanders given on the occasion of the referendum as to Australian federation, and passing in review the history of the island. The illustrations are excellent reproductions of photographs by the photo-vitrile process.

South Australia.

Mem. R.S. South Australia 1 (1899): 1-40. Stirling and Zietz.

Fossil Remains of Lake Callabonna. Part i. Description of the Manus and Pes of *Diprotodon Australis*, Owen. By E. C. Stirling and A. H. C. Zietz. *With Plates.*

Tonga Islands.

American J. Sci. 9 (1900): 193-198.

Agassiz.

Explorations of the *Albatross* in the Pacific. By Alexander Agassiz. III. [Also in *Science* 11 (1900): 288-292.]

Western Australia.

Scottish G. Mag. 16 (1900): 161-170.

Wittenoom.

Western Australia in 1899. By the Hon. E. H. Wittenoom.

POLAR REGIONS.**Antarctic.**

Markham.

Die Aufgaben der geplanten Südpolar Expeditionen. Von Sir Clements R. Markham. Vortrag, gehalten am 29 Sept. 1899 vor dem 7 intern. Geogr.-Kongress zu Berlin. Autorisierte freie Uebersetzung von Heinrich Brunner. Zurich, 1900. Size $7\frac{1}{2} \times 5$, pp. 16. *Presented by the Translator.*

Translated from the *Geographical Journal* for November, 1899.

Antarctic.

Ymer 20 (1900): 51-75.

Nordenskjöld.

Sydpolarforskningens nuvarande ställning och mål. Af Otto Nordenskjöld. *With Chart.*

On the actual state of our knowledge of the antarctic regions, and the aim of future work.

Antarctic—Belgian Expedition.

Lecoq.

B.S.R.G. d'Anvers 24 (1900): 5-51.

Expédition Antarctique belge. *With Portraits and Maps.*
An account of the reception of the Belgian Antarctic Expedition on its return, including the paper describing the expedition read by M. Georges Lecoq, the second in command of the expedition.

Arctic.

B.S.G. Italiana 1 (1900): 228-242, 339-363, 410-435.

Schoch.

Una crociera nel Mar Polare Artico. Note prese a bordo della baleniera norvegese "Hertha" dal Giulio Schoch. *With Illustrations.*

A cruise in the early summer of 1899 on the Norwegian whaler *Hertha*, on the edge of the ice between Spitsbergen and Greenland.

Arctic.

B.S.G. Madrid 42 (1900): 7-36.

Sobral.

Estudios sobre las Regiones árticas. Por D. José Gutiérrez Sobral. I. De Cabo Norte á Yugor. II. Spitzberg. III. Francisco José y Nueva Zembla.

Franz Josef Land.

M.G. Ges. Wien 43 (1900): 15-24.

Brosch.

Prof. Dr. Nansen und Payer's Karte von Franz Josef-Land. Von Gustav Ritter von Brosch. *With Maps.*

Criticism of Dr. Nansen's observations made on his return journey from the farthest north to Franz Josef Land, referring to a recent controversy in the *Nautical Magazine*.

Polar Exploration.

B.S.R. Belge G. 23 (1899): 345-365, 393-414.

Wauwermans.

La conquête des Pôles. A propos de l'Expédition de Gerlache. Par Lieutenant-General Wauwermans. *With Map.*

This deals with a wide range of subjects, including oceanography in general.

Polar Regions—Whaling.

Hegemann.

Ann. Hydrographie 28 (1900): 120-125.
Die gegenwärtige Eismeerfischerei und der Walfang.

MATHEMATICAL GEOGRAPHY.

- Cartography.** *Riv. G. Italiana* 7 (1900): 177-186. **Fiorini.**
 Proiezioni cartografiche cicloidali. Nota di M. Fiorini. Also a separate copy.
Presented by the Author.

- Cartography.** *Petermanns M.* 46 (1900): 42-46. **Hammer.**
 Unechtylindrische und unechtkonische flächentreue Abbildungen. Mittel zum
 Auftragen gegebener Bogenlängen auf gezeichneten Kreisbögen von bekannten
 Halbmessern. Von Prof. Dr. E. Hammer.

This is referred to in the *Journal* for April, p. 427.

- Cartography—Density.** *G.Z.* 6 (1900): 220-221. **Henkel.**
 Berechnung der Dichte des Eisenbahnnetzes. Von Dr. L. Henkel.

The problem of representing the relative closeness of the network of any lineal distribution (such as length of rivers, railways, or telegraph lines) over a country is solved by taking as unit of comparison, say of railway density, the width of the average mesh which would be formed by ruling a square representing the area of a country into smaller squares; the sum of the lines used in ruling being equivalent to the total length of the railways. Thus the smaller the square representing the mean mesh of the railway net, the denser is that net. The figures obtained for the mean mesh of the railway net in statute miles are Belgium, 8.6; Great Britain, 11.8; German Empire, 15; Switzerland, 16.5; France, 17; United States, 40; India, 102; European Russia, 199.

- Cartography—Official Maps.** **Farquharson.**
 Foreign Topographic Maps. By Colonel Sir John Farquharson, K.C.B. Size
 10 x 6½, pp. 14. *Privately printed.*

This is a series of memoranda prepared to accompany a collection of specimens of the official survey maps of all foreign countries with regard to the method and manner of their engraving and printing.

- Cartography—Population Maps.** *G.Z.* 6 (1900): 185-193. **Hettner.**
 Ueber bevölkerungstatistische Grundkarten. Von Prof. Dr. Alfred Hettner.
With Map.

A proposal to adopt a system of indicating the number of inhabitants in every inhabited place marked on a map by means of special signs graduated in size or in depth of shading to express the approximate number of inhabitants.

- Geodesy.** *Deutsche Rundschau G.* 22 (1900): 363-367. **Carlheim-Gyllensköld.**
 Die Aufgabe der modernen Geodäsie. Von V. Carlheim-Gyllensköld.

- Geodesy.** *Science* 11 (1900): 369-374. **Hayford.**
 Recent Progress in Geodesy. By Dr. J. F. Hayford.

- Geodesy—Levelling.** **Zachariæ.**
Översigt K. Danske Vidensk. Selsk. Forhand. (1899): 491-544.
 Præcisionsnivelementet over Øresund. Af General-major G. Zachariæ. (With
Résumé in French.)

On the method employed and the results obtained in levelling operations along three lines across the Sound, in order to connect the levels of Sweden with those of Denmark independently of the level of the intervening sea.

- Measurement of Map Areas.** *G.Z.* 6 (1900): 139-148. **Hammer.**
 Die Genauigkeit der Flächenangaben in der Geographie. Ein Vorschlag. Von
 Prof. Dr. E. Hammer.

On the degree of precision to be obtained in measuring areas on maps, as the result of which the author finds that decimals are valueless for any area over 500 square kilometres; that no area between 1000 and 20,000 can be exact to a closer degree than from one to ten units; and that areas over 500,000 are of no significance save with rounded hundreds; while over 2,000,000 square kilometres they can only be trusted to round thousands.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

- Astronomy—Nebular Hypothesis.** *J. Geology* 8 (1900): 58-73. **Chamberlin.**
 An attempt to test the Nebular Hypothesis by the relations of masses and
 momenta. By T. C. Chamberlin.

The result of this discussion is to show relationships of mass and momentum, which are apparently incompatible with the evolution of the solar system from a gaseous spheroid controlled by the laws of hydrodynamic equilibrium.

No. I.—JULY, 1900.]

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- Atmospheric Circulation.** *Sitzb. A. W. Berlin* (20) (1900): 356-372. **Bezold.**
Zur Thermodynamik der Atmosphaere. Von Wilhelm von Bezold. V. Die klimatologische Bedeutung der Lehre von der auf- und ab-steigenden Luftströmen.

- Geology.** *Science* 11 (1900): 561-574. **Osborn.**
The Geological and Faunal relations of Europe and America during the Tertiary Period, and the theory of the successive invasions of an African Fauna. By Prof. H. F. Osborn. *With Charts.*

- Geomorphology.** *C. Rd.* 130 (1900): 449-461. **Bertrand.**
Déformation tétraédrique de la Terre et déplacement du pôle. Note de M. Marcel Bertrand. *With Diagrams.*

This important memoir will be summarized in the *Journal*.

- Geomorphology.** **Lapparent.**
Sur la symétrie tétraédrique du globe terrestre. Par M. de Lapparent. (Extrait des *Comptes rendus des Séances de l'Académie des Sciences*, t. cxxx., séance du 5 mars 1900.) Size 11 × 9, pp. 6. *Presented by the Author.*

In this paper M. de Lapparent calls attention to the theory of Mr. Lowthian Green as to the tetrahedral symmetry of the Earth.

- Geomorphology.** **Suess.**
La Face de la Terre (Das Antlitz der Erde). Par Ed. Suess. Traduit . . . et annoté sous la direction de Emmanuel de Margerie. Tome ii. Paris: A. Colin et C^o, 1900. Size 10 × 6½, pp. 878. *Maps and Illustrations. Presented by the Publishers.*

This is the translation of the second volume of Suess's great work, the first having been noted in the *Journal*, vol. xi. (1898), p. 440. The second volume, which deals with the ocean basins, was published in 1888, and the translators have brought the matter down to date by including a great number of notes to recent literature. The original illustrative diagrams have been reinforced by twice as many, now added for the first time. The want of an index is a serious drawback, but the provision of an adequate index to such a book would be a very serious labour.

- Oceanography.** *Öfversigt K. Vet. A. Förhand. Stockholm* 56 (1899): 857-872. **Cleve.**
On the origin of "Gulf Stream water." By P. T. Cleve.

The method of study is by the observation of the plankton contained in the water, and these have convinced Mr. Cleve that the "Gulf Stream water" (as water of about 3.50 per cent. salinity in the North Atlantic is usually called) comes into the North Atlantic along the west coast of Africa and between the Azores and Europe as an under-current.

- Oceanography.** *Öfversigt K. Vet. A. Förhand. Stockholm* 56 (1899): 785-808. **Cleve.**
On the Seasonal Distribution of some Atlantic Plankton-organisms. By P. T. Cleve.

- Oceanography.** **Dickson.**
The Mean Temperature of the Surface Waters of the Sea round the British Coasts, and its relation to the mean temperature of the air. By H. N. Dickson. (From the *Quarterly Journal of the Royal Meteorological Society*, vol. xxv., No. 112, October, 1899, pp. 277-302.) Size 10 × 6½. *Presented by the Author.*

- Oceanography.** *Öfversigt K. Vet. A. Förhand. Stockholm* 56 (1899): 141-166. **Pettersson.**
Ueber den Einfluss der Eisschmelzung auf die Oceanische Cirkulation. Von O. Pettersson. *With Charts, etc.*

On the influence of the melting of sea-ice on oceanic circulation.

- Oceanography.** *Ann. Hydrographic* 28 (1900): 74-75. **Witte.**
Das kalte Küstenwasser. Von E. Witte.

Herr Witte claims priority for the discovery in 1870 that the cold water found near coasts was due to up-welling from a great depth, and he recalls attention to the three agencies which he believes to be concerned in producing the up-welling, viz. (1) the deviation of currents by the Earth's rotation causing a reduction of pressure on the convex side of the curve, (2) the action of off-shore winds, and (3) centrifugal force. The second cause is that usually recognized as of the greatest, if not the sole, importance.

- Oceanography.** *Tijds. K. Ned. Aard. Genoots. Amsterdam* 17 (1900): 115-118. —
On the work of the *Siboga* expedition in the seas of the Malay archipelago in September and October, 1899.

Oceanography.

Hjort, Nordgaard, and Gran.
Bergens Museum. Report on Norwegian Marine Investigations, 1895-97. By Dr. Johan Hjort, O. Nordgaard, and H. H. Gran. Bergen: J. Grieg, 1899. Size 15 x 11, pp. 22, 20, and 30. *Maps and Plates. Presented by D. M. M. Crichton Somerville, Esq.*

Oceanography—Museum. *Rev. Scientifique* 13 (1900): 528-530.

Richard.

Le Muséum océanographique de Monaco. Par M. Jules Richard. *With Illustrations.*

Describes and illustrates the museum founded by the Prince of Monaco and opened last year for the purpose of bringing together all objects of interest relating to oceanography.

Rivers. *G.Z.* 5 (1899): 434-456; 6 (1900): 97-104, 148-170.

Ule.

Die Gewässerkunde im letzten Jahrzehnt. Von Willi Ule.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.**Anthropogeography.** *B.S. Neuchatel. G.* 12 (1900): 219-260.

Brunhes.

L'Homme et la Terre cultivée. Bilan d'un siècle. Par Jean Brunhes, professeur de géographie, à l'Université de Fribourg.

This is an extract from a monumental work to be published in Paris by MM. Goupil, which will summarize the progress made during the nineteenth century in all sciences. The present article considers the relations between the human race and the vegetation of the Earth, both with respect to the problem of developing the land, and to the history of the introduction of new cultures.

Anthropogeography. *Scottish G. Mag.* 16 (1900): 121-138.

Mill.

The Development of Habitable Lands. An essay in Anthropogeography. By Hugh Robert Mill, D.Sc.

Anthropogeography—Census. *J.R. Statistical S.* 63 (1900): 41-71.

Baines.

On Census-taking and its Limitations. By J. A. Baines.

Commercial Geography—Cables. *Rev. Française* 25 (1900): 153-160.

Demanche.

Les projets de Cables. Par M. G. Demanche. *With Map.*

The map shows the existing British and French submarine cables, and those which are projected. The projects treated as most urgent is the construction of a French cable along the West African coast to St. Louis, and from Kotonou to Libreville, also cables from Tamatave to Reunion, and from Hue to Amoy.

Commercial Geography—Silk. *Ann. G.* 9 (1900): 97-118.

Groffier.

La production de la soie dans le monde. Par M. V. Groffier. *With Map.*

Historical—Cabot.

Quevedo.

El "Sebastian Gaboto" de Henry Harrisse. Por S. A. Lafone Quevedo, M.A. 1st and 2nd parts. Buenos Aires, 1898-99. Size 10½ x 7½, pp. (part i.) 34; (part ii.) 62. *Facsimile Maps. Presented by the Author.*

Historical—Discovery of America. *Deutsche Rundschau G.* 22 (1900): 289-295.

Stock.

Zum neunhundertjährigen Jubiläum der ersten Entdeckung Amerikas (a. 1000 n. Chr.). Von Franz Stock.

Historical—Ebstorf Map.

Miller.

Die Ebstorffkarte, eine Weltkarte aus dem 13 Jahrhundert. Herausgegeben und erläutert von Dr. Konrad Miller. Dritte Auflage. Stuttgart und Wien: J. Roth, 1900. Size 9½ x 6½, pp. 128. Price 1.50m.

Historical—Geographical Society. *B.S.G. Marseille* 23 (1899): 365-375.

Fournier.

Une Société de Géographie à Marseille en 1801. Par M. Joseph Fournier.

The French "Société de l'Afrique intérieure" was founded in Paris shortly after the Revolution, on the model of the African Association of London, and removed to Marseilles in 1801.

Historical—Identification. *G.Z.* 6 (1900): 194-199.

Ruge.

Ueber Identifizierung antiker Oertlichkeiten. Von W. Ruge.

On the method of identifying ancient sites from the names or descriptions given in old works.

Historical—Maps.

Ymer 20 (1900): 15-23.

Nordenskiöld.

Randteckningar i gamla handskrifter af Datis La Sfera. Af A. E. Nordenskiöld.
With Facsimile Maps.

On the marginal drawings on the ancient manuscripts of Dati's fifteenth-century map entitled 'La Sfera.'

Town Plans.

Z. Ges. Erdk. Berlin 34 (1899): 446-462.

Schlüter.

Ueber den Grundriss der Städte. Von Dr. Otto Schlüter. *With Plate.*

A study of the ground plan of towns, with reference to the cause of their origin and the manner of their growth.

BIOGRAPHY.**Biographical Dictionary.**

Lee.

Dictionary of National Biography. Edited by Sidney Lee. Vols. lix-lxii. London: Smith, Elder & Co., 1899-1900. Size 10 x 6½, pp. (vol. lix.) vi. and 460; (vol. lx.) vi. and 470; (vol. lxi.) vi. and 476; (vol. lxii.) vi. and 452. *Price (each vol.) 15s.*

The following names of geographical interest appear among the notices in these volumes:—Vol. lix., Sir Charles Pyndar Beauchamp Walker, by Colonel E. M. Lloyd; General James Thomas Walker, by Colonel R. H. Vetch; Horace Waller, by G. C. Boase; John Wallis, by E. Irving Carlyle; Samuel Wallis, by Prof. J. K. Laughton; Rev. Richard Walter, by the same; Peter Egerton Warburton, by C. Alexander Harris; James Clifton Ward, by Rev. Prof. T. G. Bonney; John Ward, by Prof. J. K. Laughton; Rear-Admiral John Washington, by E. C. Marchant. Vol. lx., Major-General Sir Andrew Scott Waugh, by Colonel R. H. Vetch; James Weddell, by Prof. J. K. Laughton; Isaac Weld, by T. Seccombe; Edward Wells, by Thompson Cooper; James Raymond Wellsted, by Prof. J. K. Laughton; George Weymouth, by the same; Sir George Wheeler, by Warwick Wroth. Vol. lxi., Sir Richard Whitbourne, by E. Irving Carlyle; John White, by T. Seccombe; Samuel Edward Widdrington, by E. Irving Carlyle; Sir John Gardner Wilkinson, by Rev. Prof. D. S. Margoliouth. Vol. lxii., Bishop Willibald, by Miss A. M. Cooke; William John Wills, by C. A. Harris; Andrew Wilson, by G. Le Grys Norgate; William Rae Wilson, by T. Bayne; John Windus, by T. Seccombe.

Camperio.

Deutsche Rundschau G. 22 (1900): 375-378.

Stettner.

Manfredo Camperio. *With Portrait.*

Born 1826, died 1899, the subject of this notice was indefatigable in promoting the cause of geography in Italy.

Crepy.

Société de Géographie de Lille. Séance Solennelle du Dimanche 21 Janvier 1900. [Vingt ans de présidence de M. Paul Crepy.] Extrait du Bulletin de Février 1900. Lille, 1900. Size 10 x 6½, pp. 16. *Portrait. Presented by the Société de Géographie of Lille.*

François.

Deutsche Rundschau G. 22 (1900): 374-375.

Curt v. François. *With Portrait.*

General.

Wolkenhauer.

Geographische Nekrologie für die Jahre 1898 und 1899. Von Prof. Dr. W. Wolkenhauer. Size 8½ x 5½, pp. [20]. *Presented by the Author.*

Hasse.

Deutsche Rundschau G. 22 (1900): 324-326.

Dr. Ernst Hasse. *With Portrait.*

Mahé de La Bourdonnais.

Leblond.

Rev. G. 45 (1899): 64, 142, 217, 279, 366, 446; 46 (1900): 56.

Mahé de La Bourdonnais. Par M. M.-A. Leblond.

Marcet.

Nature 61 (1900): 497.

Tunnicliffe.

Dr. William Marcet, F.R.S. By Dr. F. W. Tunnicliffe.

Dr. Marcet was well-known as a meteorologist.

Meyer.

Deutsche Rundschau G. 22 (1900): 276-278.

Dr. Hermann Meyer. *With Portrait.*

Proskowetz.

Max von Proskowetz, mit einem Epilog. Felix von Proskowetz. [Wien: J. N. Vernay, 1899.] Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. 112. *Portrait. Presented by the Author.*

Max von Proskowetz (1851-1898) was in the German consular service, and a voluminous writer on geographical, economic, and other subjects. A list of his writings is given in an appendix.

Symons.

Symons's Monthly Meteorolog. Mag. 35 (1900): 17-18.

Wallis.

George James Symons, F.R.S. By H. Sowerby Wallis. [See also *J.S. Arts* 48 (1900), 367.]

Mr. Symons was eminent as a meteorologist, and the particular object of his studies was the rainfall of the British Islands. He initiated a voluntary system of rainfall stations, and developed it until it included over 3000 observers. He was born August 6, 1838, and died March 10, 1900.

Tillo.

Terrestrial Magnetism 5 (1900): 8.

Lieutenant-General Alexis de Tillo. *With Portrait.*

Tillo.

Petermanns M. 46 (1900): 41-42.

Woeikow.

Alexis v. Tillo. Von Prof. Dr. A. Woeikow.

Vespucci.

Riv. G. Italiana 7 (1900): 109-114.

Harris.

Per Amerigo Vespucci. Una lettera di Henry Harris.

Zeller-Horner.

Walder.

LXIII. Neujahrsblatt zum Besten des Waisenhauses in Zürich für 1900. Heinrich Zeller-Horner als Erforscher und Darsteller der Schweizer Gebirgswelt. Von Prof. Dr. E. Walder. Zürich, 1900. Size 11×9 , pp. 44. *Panorama. Presented by H. Brunner, Secretary of the Stadtbibliothek, Zurich.*

Biography of a Swiss artist (born 1810, died 1897), whose special study was mountain-scenery.

GENERAL.**Big Game.**

Scheibler.

Felice Scheibler. Sette Anni di Caccia Grossa e Note di Viaggio in America, Asia, Africa, Europa. Milano: Ulrico Hoepli, 1900. Size 10×7 , pp. xvi. and 526. *Illustrations. Price, Lire 14. Presented by the Publisher.*

A profusely illustrated record of big-game shooting during seven years' wanderings in the Rocky mountains, India, Ceylon, Somaliland, Equatorial Africa, and Russia.

British Colonies.

Statistical Tables relating to the Colonial and other Possessions of the United Kingdom. Part xxii. 1894-95-96. London: Eyre & Spottiswoode, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. x. and 866. *Price 6s. 10½d.*

The statistics contained in these tables are of the most comprehensive character.

California University.

The International Competition for the Phoebe Hearst Architectural Plan for the University of California. [San Francisco, 1899.] Size $10\frac{1}{2} \times 13\frac{1}{2}$, pp. 152. *Illustrations. Presented by the University of California.*

This book is printed in parallel columns in English, French, Italian, and German. Excellent as the plans of the successful competitor are, they are defective in making no provision for the study or teaching of geography.

Catalogue of MS.

Ministère de la Guerre. Inventaire Sommaire des Archives historiques. (Archives Anciennes. Correspondance.) Tome Premier. Fasc. i. and ii. Paris: Imprimerie Nationale, 1898-99. Size $10 \times 6\frac{1}{2}$, pp. viii. and 472. *Presented by the French Minister for War.*

Catalogue of 1615 numbered series of MS. documents, dating from the middle of the sixteenth century to 1792, and referring mainly to military operations.

Educational—Methods. *B.S. Neuchatel G.* 12 (1900): 5-36.

Girard.

Sur l'enseignement de la géographie dans les collèges. Par Raymond de Girard.

An interesting lecture, full of examples of the improper teaching of geography, and urging the study of the subject in a systematic and intelligent manner.

Educational—Textbook.

Reusch.

Geografi for Middelskolen. Af Dr. Hans Reusch. Kristiania: T. O. Brøgger, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 182. *Illustrations. Presented by the Author.*

A well-planned and illustrated school-book.

- Game destruction.** *Quarterly Rev.* 191 (1900): 299-316.
 An Age of Extermination.
- Geographical Congress.** *B.S.R. Belge G.* 23 (1899): 415-423. **Leclercq.**
 Le VII^{me} Congrès International de Géographie à Berlin. Par M. Jules Leclercq.
- Medical Geography—Malaria.** *B.S. d'Etudes Colon.* 7 (1900): 101-112. **Broden.**
 La Malaria d'après les dernières recherches des Italiens. Par le Dr. A. Broden.
- Medical Geography—Plague.** *National G. Mag.* 11 (1900): 97-113. **Sternberg.**
 The History and Geographic Distribution of Bubonic Plague. By George M. Sternberg, LL.D.
- Place Names.** *J.S. Arts* 48 (1900): 365-367. **Birdwood.**
 Etymology of Africa and Ophir. By Sir George Birdwood.
 Sir George Birdwood shows that Dr. Carl Peters' theory that "Africa" was derived from "Ophir" is historically and etymologically untenable, the name being derived from the Phœnician *Afrykah*, meaning "the colony."
- Year-Book.** **Keltie and Renwick.**
 The Statesman's Year-Book. Statistical and Historical Annual of the States of the World for the year 1900. Edited by J. Scott Keltie, LL.D., with the assistance of I. P. A. Renwick. London: Macmillan & Co., 1900. Size 7½ × 5, pp. xxxvi. and 1280. *Maps. Price 10s. 6d. Presented by Dr. J. Scott Keltie.*
 In addition to the usual thorough revision, this issue of the 'Statesman's Year-Book' contains a series of valuable statistical tables of the production of various commodities, and a series of valuable maps showing the reorganization and rectification of boundaries in North-East Africa, Nigeria, and French West Africa, Pacific islands, and British Guiana.

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 Murray's Handy Classical Maps. Edited by G. B. Grundy, M.A. Italia and Sicilia. Scale 1: 1,200,000 or 18.9 stat. miles to an inch. *Price 1s. 6d.* Hispania. Scale 1: 2,500,000 or 39.4 stat. miles to an inch. *Price 1s.* London: J. Murray, 1900. *Presented by the Publisher.*
 Murray's series of Handy Classical Maps, to which these belong, will no doubt be very useful for educational purposes. The maps are prepared under the superintendence of Mr. G. B. Grundy, M.A., of Brasenose College, Oxford, and show the physical features by a system of hachuring and colouring.
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- England and Wales.** **Bartholomew.**
 Bartholomew's Reduced Ordnance Survey of England and Wales. Scale 1: 126,620 or 2 stat. miles to an inch. Sheet 5: North Lancashire. J. Bartholomew & Co., Edinburgh, 1900. *Price 2s. mounted on cloth. Presented by the Publishers.*
 This sheet includes the country in the neighbourhood of Morecambe bay, extending from Preston on the south to Kendal on the north, and from the coast on the west to Blackburn on the east. The Isle of Man is given, on the same scale, as an inset. As in other sheets of this series, the relief of the country is well brought out by contours and colouring, and the driving and cycling roads are shown in red. The map is well suited to meet the requirements of the tourist.
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 Publications issued since May 8, 1900.
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Europe.

Hergesell.

Luftdruck und Temperatur-Verteilung über Europa in verschiedenen Höhen am 24^{ten} März, 1899. Von Prof. Dr. H. Hergesell. *Petermanns Geographische Mitteilungen*, Jahrgang 1900. Maps. 8, 9. Justus Perthes, Gotha, 1900. Presented by the Publisher.

The first of these two sheets shows the distribution of the atmospheric pressure and temperature over Europe on March 24, 1899, at sea-level, and at altitudes of 5000 and 10,000 metres. The second illustrates, by a series of eight diagrams, the daily range of temperature at different altitudes and seasons of the year. The first three of these diagrams show the mean annual daily range at sea-level and on the spire of Strassburg cathedral, and the daily range for winter and summer as observed at sea-level and the top of the Eiffel Tower. These charts accompany an interesting paper by Prof. H. Hergesell in *Petermanns Mitteilungen* for May, 1900.

France.

Johnston.

Plans of Paris and the Exhibition, with Map of France. W. & A. K. Johnston, Edinburgh and London. Price 1s. coloured. Presented by the Publishers.

A general map of France and plans of Paris and the Exhibition Buildings are given on this sheet, which will doubtless be useful to tourists.

Germany.

Königl. Preuss. Landes-Aufnahme.

Karte des Deutschen Reiches. Scale 1: 100,000 or 1·6 stat. mile to an inch. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme, 1899. Sheets: 287, Lehrte; 305, Ahaus; 307, Iburg; 309, Lemgo; 310, Hameln; 329, Koesfeld; 332, Gütersloh; 356, Soest.

Germany.

Langhans.

Die wirtschaftlichen Beziehungen der deutschen Küsten zum Meere. Scale 1: 1,500,000 or 23·7 stat. miles to an inch. Paul Langhans. *Petermanns Geographische Mitteilungen*, Jahrgang 1900, Tafel 10. Justus Perthes, Gotha, 1900. Presented by the Publisher.

Italy.

Istituto Geografico Militare.

Carte d'Italia. Scales 1: 25,000 and 1: 50,000. Istituto Geografico Militare, Firenze. Price 50 centesimi each sheet.

Sheets: 15—III. N.E., S.E., S.O., Antronapiana; 131—II. Spoleto, III. Massa Maritima; 147—III. Caramanico; 152—II. Alvito, IV. Trasacco; 161—I. Isernia; 166—II. Isola Asinara; 167—II. Isola Rossa; 179—I. & IV. Porto Torres, II. Monte Forte, III. Capo dell' Argentiera; 180—I. Castel Sardo, IV. Cantoniera Pedras de Fogu; 181—II. Monti, IV. Tempio Pausania; 182—II. Tanaunella, III. San Teodoro d'Oviddè; 192—I. Alghero, II. Monte Mannu, IV. Capo Caccia; 193—III. Pozzomaggiore; 194—I. Budduso, II. Bitti; 195—I. Posada, II. Cantoniera di Orosei, III. Orosei, IV. Siniscola; 224—I. S.E. Bocca di Riu Piscinas, II. S.E. Buggeru, II. N.E. Capo Pecora; 225—I. S.O. S. Gavino Monreale, I. N.E. Lunamatrona, I. N.O. Sardara, I. S.E. Sanluri, II. S.E. Villasor, II. N.E. Serramanna, II. N.O. Villacidro, II. S.O. Vallermosa, III. S.O. Miniera di S. Benedetto, III. N.O. Fluminimaggiore, III. N.E. Gonnosfanadiga, III. S.E. Miniera sa Duchessa, IV. S.E. Guspini, IV. N.E. Casa Zeppara, IV. S.O. Montevecchio, IV. N.O. Monte Arcuentu; 226—I. Escalaplano, II. S. Nicolo Gerrei, III. Nuraminis, IV. Mandas; 227—III. Muravera; 232—I. S.O., II. N.O. Isola di S. Pietro, I. N.E. Nebida, II. N.E. Calasetta, II. S.E. S. Antioco; 232 bis—I. N.E. Capo Sperone; 233—I. N.O. Siliqua, I. N.E. Villaspeciosa, I. S.O. Acquacadda, I. S.E. Monte Arcosu, II. S.E. Punta Sèbera, II. S.O. Is. Carillus, II. N.E. S. Barbara, II. N.O. Santadi, III. N.O. Serbariu, III. S.E. Villarios Masainas, III. N.E. Villaperuccio, III. S.O. Golfo di Palmas, IV. S.O. Barbusi, IV. S.E. Narcao, IV. N.E. Domusnovas, IV. N.O. Iglesias; 235—III. N.O. Villasimius, IV. N.E. Capo Ferrato, IV. S.O. Castiadas; 239—I. N.O. Teulada, I. N.E. Doms de Maria, I. S.O. Capo Malfatano, I. S.E. Capo Spartivento, IV. N.E. Porto Pino, IV. S.E. Capo Teulada, IV. N.O. S. Efisio.

Portugal.**Delgado and Choffat.**

Carta Geologica de Portugal. Por J. F. N. Delgado e Paul Choffat. Scale 1: 500,000 or 7·8 stat. miles to an inch. Direcção dos Trabalhos Geologicos, Lisbon, 1899. 2 sheets. *Presented by the Direcção dos Trabalhos Geologicos.*

The Portuguese Government survey map on the scale of 1: 100,000 forms the geographical basis of this geological map of Portugal. The geological features are shown by a system of well chosen colours, in addition to which numerous heights are given in figures. Great care has evidently been taken with the printing.

Turkey.**Turkish General Staff.**

Map of European Turkey. Scale 1: 216,000 or 3·4 stat. miles to an inch. Turkish General Staff, Constantinople, 1899. 12 sheets. In Turkish character.

ASIA.**Asia.****Service Géographique de l'Armée, Paris.**

Asie. Scale 1: 1,000,000 or 15·8 stat. miles to an inch. Sheet: Iles Riou-Kiou. Service Géographique de l'Armée, Paris. *Price 1·25 fr.*

Another of the sheets of Eastern Asia on the 1: 1,000,000 scale, now being published by the Service Géographique de l'Armée, Paris.

AFRICA.**Egypt.****Survey Department, Public Works Ministry.**

General Map of Egypt. Sheet D 4, Kharga Oasis. Scale 1: 500,000 or 7·8 stat. miles to an inch. Survey Department, Public Works Ministry, 1900. *Presented by Captain H. G. Lyons, R.E.*

This sheet is an indication of the excellent work now being performed by the Egyptian Survey Department, under the superintendence of Captain H. C. Lyons, R.E. It forms part of general map, which is to embrace a wide area, and includes the Kharga oasis situated to the west of the Nile about 120 miles to the south of Siut. Hills are shown by brown shading, and the lettering and routes are in black. Heights are given in metres.

Madagascar.**Locamus.**

Carte de Madagascar. Scale 1: 500,000 or 7·8 stat. miles to an inch. Par P. Locamus. Sheets: 1, Iles Comores; 3, Majunga; 4, Maroantsetra. Paris: Maison Ardriveau-Goujon. H. Barrère.

These are three sheets of the map of Madagascar, which was noticed in the *Geographical Journal* of last month.

Orange Free State.**Johnston.**

War Map of the Orange Free State. Scale 1: 1,000,000 or 15·8 stat. miles to an inch. W. & A. K. Johnston, Edinburgh and London, 1900. *Price 6d. coloured. Presented by the Publishers.*

AMERICA.

North America.

Geological Survey of Canada.

Relief Map of Canada and the United States. Scale 1: 15,206,400 or 240 stat. miles to an inch. Geological Survey of Canada, Ottawa, 1900. *Presented by the Geological Survey of Canada.*

In this map land from sea-level to 100 feet is left white, and then four tints of brown, which increase in intensity with the altitude, show the altitudes from 100 to 1000 feet, 1000 to 5000 feet, 5000 to 10,000 feet, and above 10,000 feet. Only the more important names are given, and the map is clearly printed, but would, however, have been much more valuable to the student of physical geography if more contours on the land had been given, and if they had been continued so as to show the depths of the surrounding oceans and seas. The latest government surveys of Canada and the United States serve as the data upon which the map is based.

EASTERN ARCHIPELAGO.

Batavia.

Netherlands Government.

Topographische Kaart der Residentie Batavia. Scale 1: 100,000 or 1·6 stat. mile to an inch. 1882-83. New Edition, 1887.

In this edition railways have been added, and the map has been in other respects brought up to the date of publication. The map is printed in colours to show physical features, land under cultivation, etc., but in the mountainous regions the colouring is somewhat too dark.

East Indies.

Netherlands Government.

Atlas der Nederlandsche Bezittingen in Oost-Indië, naar de nieuwste bronnen, samengesteld en aan de regeering opgedragen door J. W. Stemfoort en J.J. ten Siethoff. Gereproduceerd, op last van het Departement van Koloniën.

The first edition of this atlas of the Dutch East Indies was completed in 1885, since which date much fresh information has been obtained concerning many of the islands, and a new edition was greatly needed. This has now been undertaken by the Netherlands Colonial Department, and five sheets have already appeared, which are as follows: Sheet No. 11, Banka island, 1: 500,000; Billiton island, 1: 400,000; Rio and the Lingen archipelago, 1: 750,000. No. 12, Western Division of Borneo, 1: 1,000,000. No. 13, South and East Division of Borneo, 1: 1,500,000. No. 15, the Lesser Sunda islands. No. 16, the Molucca islands, 1: 3,000,000. Ceram, Buru, and adjacent islands, 1: 1,000,000. Dutch New Guinea, 1: 4,000,000; and Banda islands, 1: 78,000.

GENERAL.

French Colonies.

Pelet.

Atlas des Colonies Françaises. Dressé par ordre du Ministère des Colonies par Paul Pelet. Paris: Armand Colin & Cie. Livraison I. *Price 3 fr.*

This is the first part of an atlas of the French colonies now in progress of publication. The maps, which are compiled from official sources, include the results of recent explorations and researches, whilst the scales employed are sufficiently large to admit of a fair amount of detail being shown. Map No. 7 on the scale of 1: 2,500,000 is especially interesting just at the present time, and includes the Algerian Sahara and the southern part of the Tunis. In the north-west corner a small part of Morocco is shown, but no attempt has been made to indicate the boundary between that country and Algeria. Routes are given in red, together with the travellers' names and the dates of the journeys. No. 22 is a general map of Tonkin, on the scale of 1: 500,000, and includes the country of the Songkoi (Red river) delta. No. 25, New Caledonia and its dependencies, is on several scales, ranging from 1: 1,000,000 to 1: 10,000,000. The principal map, which is of New Caledonia itself, is on the 1: 1,000,000 scale. When complete the atlas will consist of twenty-seven maps, printed in colours, besides numerous insets, and will be published in nine parts, each of which will cost three francs, and will contain three maps and descriptive letterpress.

World.

Blundau.

A. Blundau, Erdumrisskarte in flächentreuer Planisphäre. Central scale 1: 30,000,000 or 473 stat. miles to an inch. Geographischer Verlag von Carl Chun, Inh. Bernh. Fahrig, Berlin. *Price 1.40 mark.*

This is an outline map of the world published for educational purposes and the use of geographical students, on an elliptical projection, and measuring about 25 by 48 inches. There is no doubt that, whilst Mercator's projection is unequalled for the purposes of navigation, inasmuch as all bearings can be laid down upon it as straight

lines, there are times when its enormous exaggeration in the size of areas in the regions of high latitudes, as compared with those within the tropics, is a serious drawback; not merely that the inexperienced eye fails to make proper allowance for this exaggeration, and so is misled as to relative proportions, but that, in order to construct a map of the world on Mercator's projection of which the tropical regions shall be on a really useful scale, owing to the increase of the degrees of latitude towards the poles, the map often becomes unnecessarily large for the purposes of the student, and difficult to place on the table. These considerations have led the author to draw this outline-map of the world on the elliptical projection, of which there are several forms; but that which he has adopted, based upon Lambert's True Plane Azimuthal Projection, is perhaps better than many, although the distortion in the form of the land areas towards the eastern and western limits of the map is very apparent. The map is merely an outline, and, in addition to the coast-line, shows only the principal rivers. No names are given, nor are the positions of the cities and most important towns indicated, which is a mistake, as these would often serve as a valuable guide, and it would certainly have been better if the outline had been more carefully drawn in some parts. However, the map will be useful to students and others for the purpose of exhibiting physical features, distribution of animal life, rainfall, and similar phenomena, which can be laid down upon it.

CHARTS.

Admiralty Charts.

Hydrographic Department, Admiralty.

Charts and Plans published by the Hydrographic Department, Admiralty, March and April, 1900. *Presented by the Hydrographic Department, Admiralty.*

- 1140 m = 4.0 River Forth:—Carron river to Stirling. 2s. 6d.
 3038 m = 1.0 Norway, west coast:—Biörnsund to Kristiansund. 2s. 6d.
- | No. | Inches. | | |
|----------|---|--|---------|
| 1647 m = | $\begin{Bmatrix} 1.0 \\ 12.0 \end{Bmatrix}$ | Plans in the Grecian archipelago:—Erisos and Problaka bays, Plati harbour (reproduction). | 1s. |
| 1692 m = | $\begin{Bmatrix} 7.2 \\ 5.2 \\ 0.7 \end{Bmatrix}$ | Anchorage on the coast of Morocco:—Zafarin islands, Melilla, Alhucemas bay (reproduction) | 1s. 6d. |
| 1149 m = | 5.8 | Plans on the west coast of Iceland:—Hvammsvig. | 1s. |
| 3091 m = | 2.9 | Newfoundland:—Little bay island to League rocks. | 2s. 6d. |
| 3117 m = | 1.2 | Lake Ontario:—Western part of the bay of Quinte, Desoronto to Presqu' ile. | 2s. 6d. |
| 2866 m = | $\begin{Bmatrix} 1.8 \\ 7.0 \end{Bmatrix}$ | United States, east coast:—Winyah bay and Georgetown harbour. | 1s. 6d. |
| 1148 m = | 3.6 | Puerto Rico: Ponce harbour, Muertos island. | 1s. 6d. |
| 3106 m = | $\begin{Bmatrix} 2.0 \\ 3.8 \end{Bmatrix}$ | Mexico:—San José del Cabo bay, San Lucas bay. | 1s. 6d. |
| 3122 m = | 0.36 | United States, west coast:—Redding rock to Cape Blanco. | 2s. 6d. |
| 3123 m = | 0.36 | United States, west coast:—Cape Blanco to Yaquina river. | 2s. 6d. |
| 3124 m = | 0.36 | United States, west coast:—Yaquina river to Cape Disappointment | 2s. 6d. |
| 1911 m = | 0.29 | North America, west coast:—Approach to Juan de Fuca strait. (Plans:—Port San Juan, Neéah bay (reproduction). | 2s. 6d. |
| 2078 m = | 9.5 | British Columbia:—Harbours and anchorages in the strait of Georgia: Sturt bay and Van Auda cove. | 1s. |
| 3048 m = | 7.8 | Mauritius:—Grand port, southern entrance and central anchorages. | 2s. 6d. |
| 1156 m = | 3.9 | Plans on the north-east coast of China:—Cochran landing. | 1s. |
| 3025 m = | 5.9 | China, north coast:—Wei Hai wei anchorage. | 2s. 6d. |
| 1648 m = | 0.14 | Japan:—Van Diemen strait to Oō Sima. | 2s. 6d. |
| 3099 m = | 0.98 | Tonga islands:—Haapai group, northern portion. | 2s. 6d. |
| 3100 m = | 0.98 | Tonga islands:—Haapai group, southern portion. | 2s. 6d. |
| 3098 m = | 0.95 | Tonga islands:—Vavau group. | 2s. 6d. |
| 1141 m = | $\begin{Bmatrix} 1.0 \\ 0.5 \end{Bmatrix}$ | Islands in the North Pacific:—Laysan island. French Frigate shoal. | 1s. 6d. |
| 300 | | Anchorage on the west and north coasts of Spitzbergen:—Plans added, Beverly sound, South haven, Bear island. | |
| 610 | | Gambia river:—Plan added, Anchorage off MacCarthy's island. | |
| 403 | | Australia, south coast, Wood point to Lowly point:—Plan added, Port Pirie harbour. | |
| 134 | | Anchorage in the New Hebrides:—New plan, Port Narevin. | |

(J. D. Potter, Agent.)

Charts Cancelled.

No.	Cancelled by	No.
1679 Plan of Erissos and Prob- laka bays on this sheet.	New plan. Erissos and Problaka bays	1647
1692 Anchorages on the coast of Morocco.	New plan. Anchorages on the coast of Morocco	1692
2866 Winyah bay and George- town harbour.	New plan. Winyah bay and Georgetown harbour	2866
479 Plan of Port Ponce on this sheet.	New Plan. Ponce harbour	1148
1930 Plans of San José del Cabo bay, and San Lucas bay on this sheet.	New sheet. San José del Cabo bay, San Lucas bay	3106
1911 Juan de Fuca strait.	New chart. Juan de Fuca strait	1911
2357 Vavu group.	New chart. Vavu group	3098

Charts that have received Important Corrections.

No. A-P, Index charts, sixteen sheets. 2010, England, west coast:—Morecambe bay. 262B, 2370, Germany, north coast:—Brüster-ort to Memel. 2646, France, west coast:—Bourgneuf to Ile de Groix. 177, Mediterranean:—The Faro, or strait of Messina. 189, Sicily:—Trapani to Marsala. 2701, Adriatic:—Gulf of Cattaro to Corfu. 2207, Black sea:—Danube river mouths. 2233, Black sea:—Sevastopol to Kertch strait. 1074, Bermuda:—Approach to Grassy bay. 1614, Falkland islands:—Stanley harbour. 2012, Central America:—San Juan del Norte. 1303, Chile:—Approaches to Lota and Coronel. 2323, Mexico, west coast:—Manzanilla bay to the gulf of California. 2324, Mexico, west coast:—Cape San Lucas to San Diego bay. 579, British Columbia:—Strait of Georgia, sheet I. 2458, Alaska:—Port Simpson to port McArthur. 2463, Alaska:—Port McArthur to Windham bay. 2337, Alaska:—Sitka sound. 1499, Alaska:—Cross sound to Kadiak island. 2172, Bering strait. 40, India, west coast:—Karachi harbour. 830, Bay of Bengal:—Bassein river to Pulo Penang. 825, Andaman islands. 3103, Andaman islands:—North part of North Andaman island. 2760, Sumatra, west coast:—Acheh head to Tyngkok bay. 942A, Eastern Archipelago, eastern portion. 2391, Ports in the Philippine islands. 1459, China:—Hong Kong harbour. 1199, China:—Kue shan islands to the Yang tse Kiang. 1124, China:—Southern approach to the Yang tse Kiang. 2657, Japan:—Gulf of Tokyo. 128, Japan:—Channels between Bingo Nada and Ozuchi sima. 1058, Australia, west coast:—Rottnest island to Warnbro' sound. 1700, Australia, west coast:—Freemantle harbour and Gage roads. 363, Australia, east coast:—Keppel bay and islands. 2921, Australia, east coast:—Claremont point to Cape Direction. 2123, New Guinea:—Orangerie bay to Bramble haven. 2460, Pacific ocean:—Kamchatka to Kadiak island. 480, New Caledonia:—Port Nouméa.

(J. D. Potter, Agent.)

United States Charts.

U.S. Hydrographic Office.

Pilot Charts of the North Atlantic and North Pacific Oceans for May, 1900.

Hydrographic Office, Washington, D.C. Presented by the U.S. Hydrographic Office.

PHOTOGRAPHS.

Canada.

Hanbury.

Ninety-three Photographs of the North-West Territories of Canada, by D. T. Hanbury, Esq. 1899. Presented by D. T. Hanbury, Esq.

Mr. Hanbury's travels in the North-West Territories of Canada in the summer of 1899 extended over a considerable area from Lake Winnipeg to Oxford House, Fort Churchill, Chesterfield inlet, and to the Clinton Golden lake and the Great Slave lake on the west. He succeeded in taking some excellent little photographs, copies of which he has presented to the Map-room. Some of these are very interesting, especially those of Esquimaux and Indians. The following is a list of their titles:—

(1) Hudson Bay Company's boat: trading with Esquimaux; (2) Kyaks tied together for carrying baggage; (3) Esquimaux dogs and cariole; (4) Midday halt; (5) Esquimaux and sleigh, Fort Churchill; (6) Arrival of Esquimaux at Fort Churchill; (7) *En route* for the north, near Lake Winnipeg; (8) Dogs trotting; (9) Building snow house; (10) Group of Chipewyan Indians near Fort Churchill; (11)

Esquimaux and sleigh, Fort Churchill; (12) Running with dogs; (13) Building kyaks; (14) Drying musk-ox robes, Fort Churchill; (15) Feeding dogs at Oxford House; (16) Arrival of Esquimaux at Fort Churchill; (17) Camp scene; (18) Hudson Bay Company's boat: Esquimaux on board trading; (19) Prince of Wales fort, Fort Churchill; (20) Mission church, Fort Churchill; (21) Building snow house; (22) Chipewyan Indian tents; (23-28) Fort Churchill; (29) Kyaks; (30) Esquimaux and snow house; (31) River near Fort Churchill; (32) Esquimaux arriving at Fort Churchill; (33) Running with dogs; (34) Drying musk-ox robes, Fort Churchill; (35) Chipewyan tents near Fort Churchill; (36) Esquimaux constructing snow house; (37-39) Dogs and carioles; (40) Dogs being fed, Oxford House; (41) Midday halt near York Factory; (42) Group of Chipewyan Indians near Fort Churchill; (43) Drying wolf-skins, Fort Churchill; (44) Kyaks tied together for carrying baggage; (45-48) Mr. Hanbury's dogs; (49) Esquimaux and sleigh, Fort Churchill; (50) Esquimaux sleighs and dogs approaching Fort Churchill; (51, 52) Fort Churchill; (53, 54) Esquimaux, Fort Churchill; (55) Esquimaux dogs; (56-59) Esquimaux and sleigh (sail set), Fort Churchill; (60) York Factory; (61) Officers' quarters, York Factory; (62) Norway house: a Hudson bay fort; (63) Arrival of Esquimaux at Fort Churchill; (64) Snow house, Fort Churchill; (65, 66) Building kyaks; (67) Esquimaux family on the coast of Hudson bay; (68) Cree Indians; (69) Group of Esquimaux; (70) Hauling up York boats in the Fall, Fort Churchill; (71) Hudson bay employes, Fort Churchill; (72) Esquimaux building snow house, Fort Churchill; (73) Buildings at York Factory; (74) Wharf, Fort Churchill; (75) Esquimaux dogs; (76, 77) Esquimaux dogs and cariole; (78, 79) Midday halt; (80) Blubber factory near Fort Churchill; (81) Building Kyaks; (82) Esquimaux searching head of his friend; (83) Esquimaux dog; (84) Group of Chipewyan Indians near Fort Churchill; (85) York Factory; (86) Esquimaux arriving at Fort Churchill with loads of venison; (87) Fort Churchill, inside view; (88) View from Fort Churchill of tidal lagoon (tide out); (89) Mission church, Fort Churchill; (90, 91) Mr. Hanbury's dogs; (92) My two trains of Esquimaux dogs; (93) No title.

East Africa.

Mardon.

Fifty Photographs of East Africa, by E. J. Mardon, Esq. *Presented by E. J. Mardon, Esq.*

As the titles will show, with one or two exceptions these photographs were all taken in British East Africa, and serve well to illustrate the characteristic features of the country. Those of the escarpment region and the great rift valley are specially interesting.

(1) Tanga, German East Africa; (2) Principal street in Tanga; (3, 4) Mombasa harbour; (5-7) Mombasa fort; (8) Principal street in Mombasa; (9) Typical station on the Uganda railway; (10) Machokas plain, looking south. Fort in the distance; (11) Entrance to Fort Machakos; (12) Camp above Kidwani stream; (13) View from near Kidwani, looking south-east; (14) Valley of the Kidwani stream; (15) Valley of the Kawa stream; (16) Koma rock from north-east; (17) View of the Bebiene and Kanjalu hills, from the Ngoleni ridge; (18) Donyo Sabuk, from north; (19, 20) View over plain from Donyo Sabuk; (21-23) Scenery on top of Donyo Sabuk; (24) Donyo Sabuk, looking towards Mount Kenia; (25, 26) View from the eastern slopes of Donyo Sabuk, of the Athi river, valley, and Kanjalu hills; (27, 28) View down the Athi valley; (29) Rapids on Athi; (30) Athi river; (31) Hippo pool on Athi; (32) Ford on Athi river; (33) Source of the Athi; (34) Lukenia rock at the end of the Ulu Kenia hills; (35, 36) Rift-valley from "rail-head" at the escarpment; (37, 38) View to the west from Erok to Kapotei across the rift-valley; (39) Gorge in which the Kilonito stream rises; (40) River Taruka from north side; (41) River Taruka from south side; (42) Camp on Gajwado river; (43) Crossing Gajwado river; (44) Gajwado river; (45) Melewo hills; (46) Gurgeish hills; (47) Masai hills; (48) View looking towards Kilimanjaro; (49) Masai women selling curd near railway; (50) Wakamba hunters near Donyo Sabuk.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.





The Geographical Journal.

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VOL. XVI.

JOURNEYS IN CENTRAL ASIA.*

By Captain H. H. P. DEASY.

FOR several years I had looked upon the portion of the map of Tibet marked "unexplored" with the greatest interest and curiosity, but it was not till the spring of 1896 that I eventually obtained sufficient leave from my regiment to undertake a journey into this prohibited and but little-known area. I was very fortunate in having for a companion my friend Arnold Pike, with whom I had travelled in the Caucasus some years previously. The object of the expedition was to survey as accurately as possible as much of the unexplored parts of Tibet as circumstances would permit. Being most anxious to carry on triangulation, and to ascertain the heights of the principal peaks, it was necessary to sacrifice to some extent linear for square measurement. In order to enter this inhospitable country without meeting any of its inhabitants at the outset, it was decided to travel by the celebrated valley of Kashmir to Ladak, and thence to the Lanak La pass.

After a brief stay in Srinagar with the hospitable Captain G. Chenevix-Trench, we left the City of the Sun for Leh, the capital of Ladak, or Kashmirian Tibet, on April 27, when the Zoji La, the pass over the Western Himalayas, was still deep in snow. The latter was, moreover, in that intermediate stage when it is most inimical to traffic, as it was soft enough to retard considerably the progress of the 105 coolies carrying our baggage. Leh was, however, reached without misadventure, and here, through the great kindness of Captain Chenevix-Trench, who had purchased for me twenty-five splendid mules in the

* Read at the Royal Geographical Society, April 2, 1900. The map will be issued with the next instalment of the paper.

previous autumn, and arranged for the supply of the balance of transport animals in the spring, no delay was experienced on this head in the organization of the expedition. As soon as minor matters had been attended to, supplies obtained, bread made, the loads weighed, and the details of the caravan equipment attended to, it was despatched from Leh on May 25, in charge of sub-surveyor S— D—, whom we christened Leno, a few days ahead of us, as the Chang La was still impracticable for animals, necessitating a *détour* for them.

The wretched village of Fobrang, not far from the Pangkong Lake, where our remaining stock of barley, suttoo, etc., was obtained through the good offices of the Wazir of Ladak, was the last village we were destined to see until our return to British territory in about five months' time. Our caravan of sixty-six baggage and riding ponies and mules, although aided by several yaks, had great difficulty in crossing the Marsemik La, which, though free from snow on the Fobrang side, was still deeply covered with it on the Tibetan side. The animals soon began to flounder about in the deep and soft snow, and in a very short time after beginning the descent, most of the loads of the first section of the caravan were strewn over the track in deplorable confusion. Finding it hopeless to reach the small camping-ground of Rimdi with the whole expedition in a single day, I had the tents, bedding, cooking-things, etc., loaded up on the freshest beasts, which contrived to struggle on through soft snow, often up to their girths, and thus reached Rimdi before dark, while the unfortunate caravan, both the men and their charges, had to face a bitterly cold night in a bleak, barren, and cheerless spot close to the pass.

Having overtaken the sheep, most of which carried 20 lbs. of barley, and the hired transport close to the Lanak La, which, though 18,000 feet, was perfectly free from snow on June 18, it was decided to halt for a day before entering the to us unknown land of Tibet. Our intention was to follow Bower's route more or less closely for a few marches; then keep to the north of it, so as to visit the north shores of Horpa or Gurmen Cho; and subsequently to travel east, keeping away from Bower's and the Polu route. The western end of the wide valley in which Mangtza and Horpa or Gurmen Cho are situated being suitable for triangulation, a halt was made there to admit of measuring a base and obtaining a trigonometric value for longitude by means of the peak fixed by the Great Trigonometrical Survey of India, and known as Mangtza Lake, No. 1 peak. Unfortunately, neither the height of this prominent peak nor of Tartary peaks Nos. 1 and 2 had been previously determined, so all the heights shown on my maps of "Portion of Tibet," etc., are based on the readings of a portable mercurial barometer kindly given to me by Prof. Norman Collie, F.R.S., and not on the height of any peak fixed by the Great Trigonometrical Survey of India.

After crossing the Lanak La, neither guides nor information

about the country were obtainable, as the Tankse men who accompanied us as far as Horpa or Gurmen Cho, denied all knowledge of places or route east of this pass. Perhaps it may be interesting to note that the minimum thermometer fell to $+8^{\circ}$ or 24° of frost during the night of June 16 at camp 1, the altitude of which is 17,450 feet. Measuring bases at camp 11 was made more tedious and complicated by the men who were sent to erect pillars at hill stations having done so, in two cases, on the sides of mountains instead of on the actual summits, as they were ordered. Unfortunately, these mistakes could not be noticed until I got close to the pillars. From the neighbourhood of this camp most extensive views are obtainable, the finest being that of the snow range



SNOW BRIDGE ON DRAS RIVER.

south of Horpa or Gurmen Cho. Some of the peaks in this range proved to be over 21,000 feet, being considerably lower than a fine double peak on the range south of the Aksai Chin, which is 23,490 feet.

Soon after starting from camp 13, Pike, who was on ahead of the caravan in pursuit of yak, saw a large lake in the distance, so we deviated from our course in order to check its position. This proved to be Yeshil Kul, a most cheerless place to camp by, on very soft ground thoroughly impregnated with salt, and destitute of either grass or fresh water. Fortunately for me, two small springs with a fair amount of grass close by were found not far from the south-east corner of the lake, and camp was moved to the most northerly spring. As it is in a most exposed place, it was by no means a pleasant place to halt in for ten

days, most of which I spent in bed with high fever. For a short time I was quite in the dark as to the nature of my ailment, but after as diligent a study of that excellent book 'Moore's Family Medicine of India' as was feasible, I either diagnosed the case or imagined I did so, and then turned to lighter literature. During the enforced halt at camp 15, or fever camp, the sub-surveyor made a short excursion for topographical purposes, and shortly after his return to this bleak and most uninviting spot, where one of the men became seriously ill and several ponies died from the severity of the weather, we gladly struck camp and moved eastwards.

Yeshil Kul, like most of the lakes we visited, must have been formerly considerably higher, and covered a very much larger area. After passing a very small salt lake close to the big one, we once more found ourselves in a country with plenty of grass and a moderate amount of fresh water.

Between camps 19 and 20 one of the most striking sights lay to the north of our route. The country was simply alive with antelope, females and young ones only, and, owing to the thousands seen, the name "Antelope Plain" was given to this, comparatively speaking, fairly level ground. As Pike, who reconnoitred for some distance east of camp 20, reported that as far as he could see, which was for many miles, in a very broad valley, there was neither grass nor water, and as the animals were by no means in a fit state to go on, with only a few handfuls of corn each, we very reluctantly decided to retrace our steps for one march, and follow the line which both of us had previously considered to be probably the more suitable, but which had been rejected owing to its leading too much south of east.

The extensive snow range south of camp 20 rendered it necessary to make a large *détour* before an eastward course was resumed. With the exception of camp 20, which was on the shore of a lake whose waters are so full of soda and other substances as to be almost undrinkable, fresh water was always obtained, but at one place the stream by which we camped only flowed for a few hours daily, being fed by the melting of the glaciers on the south side of the valley. When close to Aru Cho the scheme of going for at least a few marches along Bower's route was much favoured for a short time, but the country south-east of that lake, which was *terra incognita* to us, allured us in that direction. Considering it unwise to halt long near Aru Cho owing to the enfeebled state of the mules and ponies, I was successful in fixing the heights of only a few of the fine snow-peaks west of Aru Cho. It was not long before we bitterly regretted our keenness for keeping away from Bower's route, but, alas! it was then too late to return to it. Thinking that the alleged inability of the caravan to find all the animals at camp 31 was due to their being anxious for a day's rest, and as we had not the slightest idea that there were any

inhabitants near, we decided to leave three men behind to search for the eleven missing animals, and to rejoin us as soon as possible. To our dismay, one of these men turned up early on the second day at the next camp with the news that a few chukpas, or professional robbers, had visited our old camp soon after our departure, that they had stolen as much as they could carry away, and that one of our men was missing. At a council of war hastily convened after the receipt of this crushing news, it was decided that Pike with an escort of three men should track the chukpas to their tents, after despatching the baggage not appropriated by the robbers to the headquarter camp, while I remained behind to guard the camp and see that the animals were tied up and watched at night. I fully expected the chukpas to be watching the camp, and that as soon as Pike and his men had got well away they would pay me a visit. Hoping to encourage them and crediting them with very faint hearts, I ordered the men left behind after a search party had been sent away to look for the missing man, to remain in their tent, with the exception of one man whose duty it was to prevent the animals from straying far. As I felt very doubtful about any of the men keeping awake in the small hours of the morning following Pike's departure, I turned out at 2 a.m. and did sentry-go till day-break. This proved to be by no means a needless precaution, as the previous sentry had allowed most of the animals who were tied up close to camp to break loose. Much to my disappointment, the chukpas did not honour me with a visit, but contented themselves with the booty already obtained.

In the afternoon of the day after Pike's departure, my mind was relieved from a considerable amount of anxiety when I saw him accompanied by the three men approaching camp. His very plucky punitive mission had been so well carried out that the chukpas, who were fortunately in very small numbers in the immediate vicinity of those whom Pike called on at the early hour of daybreak, were completely surprised. When the first of the band left his tent he must have received a rude shock to his feelings, as he found Pike's revolver in close proximity to his head, and if his disturbed brains permitted, he might have noticed the rest of the force close by with their carbines presented at him. There was no sign of the missing animals, and as there were several tents and numerous yak not far off, Pike considered it expedient to be satisfied with recovering all the property stolen from us, and taking away as ransom the only two ponies that were near and the chukpas' arms. During the fighting that took place, two robbers were wounded and, as we were told long afterwards, subsequently died of their wounds, much to the gratification of our informant, a Tibetan who acted as our guide on our enforced return journey to Ladak. Further delay in hopes of getting back the lost animals, which were the best and most sound-backed, being waste of valuable time, we

decided to go south-east, or as near that direction as the country would allow, in hopes of soon meeting inhabitants. The only point which was perfectly clear was that it would be madness to think of retracing our steps to Ladak, as all the animals were in far too emaciated a condition to reach British territory, or anywhere near it. None of our men had the slightest knowledge of the country, and ours was limited to what is afforded by a blank on the map. In order that the chukpas should not benefit any further from us, we burned everything that would burn, including a Berthon boat, which was the most inflammable article of baggage, and destroyed the superfluous things which could not be disposed of by flames. Our large stock of bovril and other food-stuffs prepared by the Bovril Company, as well as all other stores, spare shoes, nails, etc., were brought on for another march, and "cached" on the off chance that some other traveller may find them useful. The tents that could not be carried were soon used up by the caravan-men for clothes, a very welcome addition to their scant and ancient wardrobes, as they had expended on clothes in the legitimate way little or none of the allowance given to each man before starting. Owing to the mountainous nature of the country, we were obliged to steer in a more or less southerly direction.

After leaving camp 33, where our stores, etc., were cached, we followed a well-defined trail, trusting that it would lead to some inhabitants from whom we hoped to obtain fresh transport; but after some miles it suddenly pegged out, and, judging from the numerous offshoots from it, must have been made by kyang and game going to and from water, which was now exceedingly scarce. Distrusting the freshness of the large lake in the distance, we tried to obtain water by digging; but, finding this plan of no avail, I went on a short distance, and from the top of a low ridge saw a few pools of water with a profusion of excellent grass all around, so I signalled to the caravan to follow me. Pike was so seedy, it was marvellous how he managed to last out this march; and, plenty of excellent grass being close by, it was deemed advisable to halt for a day by these small pools of water of very inferior quality. During the halt I went off in search of water, and to reconnoitre for the next march. The result was most disappointing, as the very necessary water was nowhere to be seen from the commanding peak I ascended, except at a great distance in a south-westerly direction, but there was a profusion of grass. Trusting to find water by digging lower down in the valley, where I had seen a stream, we chanced this plan of quenching our thirst, but without avail. The stream had been so thoroughly absorbed by the porous nature of its bed that not a drop was to be had. Pike, with his usual energy, and although still weak, went up a fairly high hill above where camp was pitched to try and discover water, or some more likely spot in which to dig for that precious liquid. From this hill very

distant views were obtained, but no water, except that which I had previously seen, was at once discerned; however, the presence of some tents and yak 5 or 6 miles away cheered us up. Although the men had been warned to husband the supply of water which each one started with from the previous camp, all of them consumed their supply on the march, the only person besides Pike and I who bore in mind the warning being S—— D——. Some of the men having expressed a wish to go in search of water, leave was given them, and although there was bright moonlight all night, and camp was at the foot of a prominent and outlying hill, these men lost their way, and did not return to camp till the next morning, when they came in from the opposite direction to that which they had taken when setting out.



CAMP SCENE IN TIBET.

As the occupiers of the tents seen by Pike might be inclined to relieve us of more animals and baggage if opportunity offered, we thought it best to approach their camp well armed and accompanied by several men, who in all probability would be of far more use with their tongues and heels than with the magazine carbines with which they were armed. In the preliminary negotiations there was a very fair chance of obtaining a guide and some yak, but unfortunately the surly headman of these nomads proved to be as unwilling to accept a present as to allowing the people under him to satisfy any of our wants. After this interference nobody would consent to guide us anywhere, even for a few marches, except for the monstrously exorbitant demand of

100 rupees, which we declined to give. After much talk, the caravan bashi Ramzan, who has now gone back to his original profession of tailoring, induced some of the nomads, under the pretence of giving them medicine, to return our visit the next day, when one of them finally consented to indicate what direction we should take for the modest sum of five rupees, while his companion was detained in camp nominally to answer our queries. This arrangement proved very disastrous to me, as, when I was shown what direction to take, an erroneous one was pointed out. When starting the next morning, a couple of hours ahead of the caravan, I foolishly followed it, and came across a pool of muddy water. After resting for a short time, I went up some hills close by, hoping to get a good view of the neighbouring country, but other heights intervened, and it was not till I had ascended three or four that my object was achieved, and then I thought it time to look out for the caravan. With the exception of some kyang and a few antelope, not a living thing was to be seen, and no water except the small muddy pool; so I descended to it, and went as quickly as I could towards the next valley, hoping to reach it before dark, but I was not successful in doing so, the distance being much greater than I had estimated. In the clear and dry atmosphere of Tibet it is, even after much practice, very hard to judge distances with any pretension to accuracy; objects that appear to be, say, only a few miles away are really 8 to 12 miles distant. By the time the adjoining valley was reached, it was far too dark to see if there were any tracks of the caravan, so I thought of resting for a few hours until the moon had risen; but, although partially sheltered from the wind by lying down in a small watercourse, this idea had to be abandoned owing to the cold, which compelled me to keep moving on. After several hours of anxious marching, varied by occasionally firing off my rifle in the hopes of attracting the attention of some of the caravan, and by continually stumbling over stones, etc., the upper part of the valley was reached, and after a short time the moon had risen sufficiently to enable me to definitely ascertain that the caravan had not ascended the valley. I now recognized that the odds against my getting anything to eat till after daybreak, at the very earliest, were very large; so I tightened my belt, took a few sips of muddy water from my three-parts empty water-bottle, and sallied off to find a short cut back to the spot I had started from, in search of the caravan. Very probably the route on my return was shorter, but several nullahs and watercourses had to be crossed, as well as a couple of steep ridges covered with rocks, over which I continually stumbled. Rest for more than a few minutes at a time was out of the question, as the cold wind soon chilled me so much that, in order to avoid being frostbitten, it was absolutely necessary to keep moving. Fortunately, it was a fine clear night, and with the help of the stars—for I never carried a compass, fearing that the chronometer

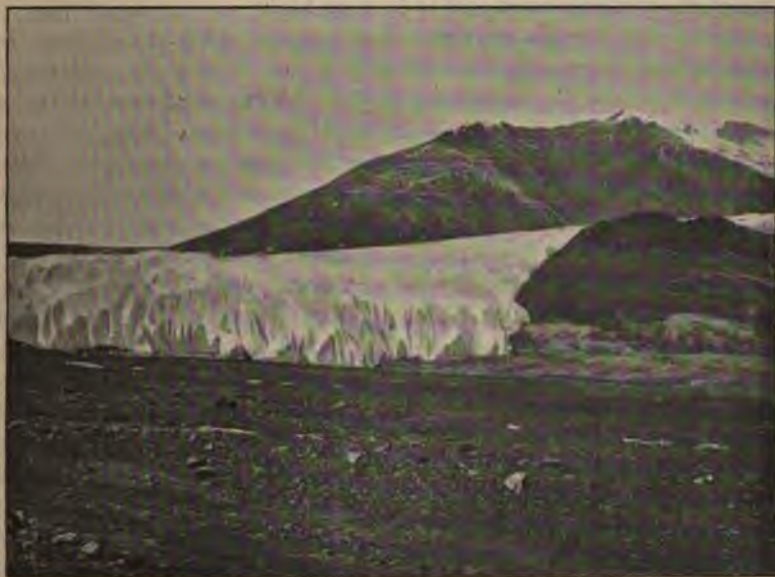
watches would be affected by it—I guided myself back to the place I wanted to reach by daybreak. From this spot, which is on comparatively high ground, the very faint smoke from the camp fire was seen very far away in the main valley, so I dragged my weary limbs towards it, and in a couple of hours was met by Pike, who came out provided with meat, biscuits, and last, but not least, rum and water, all of which were greatly appreciated. The minimum thermometer at camp registered 10° of frost, while I was wandering about on an empty stomach, with fewer clothes than usual, owing to our having entered a lower and warmer part of the country, so the discomforts of the situation were fully felt.

Not very far from camp 36, or "lost camp," we came across some rather extensive diggings, where probably gold had been found. Two days after leaving this camp, the river whose course we were following had completely sunk into the ground, and as there was not a trace of water to be seen further on, we had to halt while Pike made a long reconnaissance and spotted a very small spring, to which a move was made the next day after interviewing a native. This man professed to be in search of some of his ponies that had strayed, but it is most probable that he had been sent out from Gerge, which is not far distant, to search for us, as no doubt they had been warned of our presence by the nomads recently met. By the aid of the information extracted from this man, we found our way to Gerge, where there are a few tents, with many more in the various side valleys. Some hours after our arrival, a man, who said he was the servant of the headman of the place, nominally came to ascertain who we were and all about our intentions, but really to find out the size of our caravan. Owing to wild statements about us having been sent to Lhasa from Leh, some time before our departure, strict orders were sent every fortnight from Lhasa warning the people to be on the look-out for about 20 British officers and 3000 soldiers, who were invading Tibet from Ladak, to promptly turn them back, and report to Lhasa. In consequence of these orders, men had been sent out to search for us on the known routes, but we escaped this delicate attention by finding a way for ourselves. Some of the visitors to our camp were much surprised at the smallness of our force, but when they were informed by one of the caravan-men that countless soldiers were packed away in the yak dans and baggage, they seemed to consider the explanation quite satisfactory. When the headman of the scattered encampments, all of which are included in Gerge, came to see us, we endeavoured to get fresh transport and more supplies, but found that this could not be done without an order from the Rudok authorities. Feeling quite sure that no assistance would be obtained from that quarter, and as it was useless to wait there any longer, we gave notice of our intention to go on without it, which rather startled the headman, as he was evidently not accustomed to

having any one not conform with his orders. The messenger who announced our intention to this petty official returned with a request that we should halt for a few days longer, when he would endeavour to furnish sufficient supplies until a reply was received, probably in five or six days, from some higher official not so far distant as Rudok. This request was coupled with the intimation from the headman that our advance could only be made over the dead bodies of himself and all the Gerge people, who considered being killed by us quite as good as being executed in Lhasa for allowing us to proceed. Even talking of fighting was too much for our cowardly caravan-men, Argoons, who soon let it be known that we need not rely on them to fight in case of a row. As no signs of any instalments of supplies promised to us for waiting were visible within the appointed time, and as constant reinforcements were being received by the enemy, we settled to leave Gerge and try to strike a road, which S—— D—— had heard of from a Kulu merchant who was buying wool and gold here, leading towards a place called Kangri, where there is said to be a large bazaar during the autumn. Both Pike and I fully expected a row, so plenty of ammunition was issued to our six armed men, in hopes that they would at least loose off their weapons in the direction of the enemy, and not in ours; strict orders were issued to maintain a slow pace, admitting of the sheep marching with the ponies and mules, thus keeping the caravan in close order. To have started in an easterly direction would have certainly ensured a row, so we at first went about south-west, in the direction the Kulu trader had pointed out as being an alternative route to Kangri. Unfortunately, the information about this route proved to be false. The large crowd of Tibetans, all well mounted and armed with muzzle-loading guns, some with swords as well, who had watched us carefully, knowing that there is no other route in the direction we took except to Ladak, allowed us to depart in peace, much to our surprise, ignorant as we were at the time of the reason, for it was not till we had travelled several miles that we found out we had got false news about the road.

In the main valley (Dalung(?)) grass and fuel were scarce, and the water was of very inferior quality, but in the numerous side valleys grass is said to be plentiful. On the south side of the valley the range of high mountains, very few of which are covered with snow, appears to block the way until close to camp 45, where there is a road leading to Thok yalung, Kangri, and Rudok. Finding it hopeless to obtain any more transport, or procure barley, which was much needed, unless we promised to go to Ladak by the route which would be shown to us, and as the caravan-drivers were by this time too much afraid to go in any other direction except that which the Tibetans wished us to follow, we were compelled to submit to their terms. Besides these factors in the case, there were two others equally important: many of our animals were covered with sores, and all of them were in

far too weak and deplorable a condition for us to think of attempting forced marches in an inhabited country where further progress could very easily be effectively stopped, without the slightest risk to the Tibetans, by their driving away our animals while grazing at night. There was now nothing else to be done but to agree to return to Ladak by the route along which we should be guided. As soon as some very ancient ponies had been purchased at high prices, and sufficient transport obtained locally, we began our return march to Ladak, relieved, at least temporarily, of the anxiety about finding grass and water at the end of every march, as two guides were provided. Up to this point we had found our own way for the last three months over about 460



GLACIER NEAR NABO LA PASS.

miles of, to us, unknown country. Now that there was an opportunity of relieving from loads the animals that were in a very bad way from sores and galls, I commenced to wash and dress the wounds, many of which were far too bad to describe. Although this was done on every possible occasion—not by the caravan-men, whom I could not trust to do the unpleasant work satisfactorily—only one of the animals with sore backs, and that a very slight one, lived to reach Ladak.

The Tibetans evidently feared that we would endeavour to go straight to Rudok, and, no doubt with the intention of preventing us from doing so, led us up a very narrow valley on the north side of the main one, most of which was said to be called Dalung, and accompanied us in

large numbers for five marches, the excuse for taking us by this long route being that if the direct route was followed several high passes would have to be crossed. This proved very fortunate, as the sub-surveyor was thus enabled to sketch the country between the outward and homeward routes. In order to make certain of the guides following this route, which towards the end they were not at all well acquainted with, we expressed great eagerness to go direct to Rudok, and it was only after we had been repeatedly informed that numerous high passes had to be negotiated that we ceased to express any desire to deviate from the line our guides were instructed to show us. I do not know what the Tibetans' idea of high passes may be, but as the height of one we crossed is 18,880 feet, we rejoiced at not having been obliged to attempt those which were said to be very high.

The country for the next few marches was much closer than that which we had previously been travelling in. Water was exceedingly scarce, and, except for our having guides who knew the country not far distant from Lima Ringmo Chaka, it would have been almost impossible to find our own way. For five marches the small springs were almost impossible for any one not thoroughly acquainted with the country to locate, and grass was very scarce, so that our wretched ponies and mules suffered considerably. Besides the scarcity of grass, another matter which caused anxiety was the risk of some of our escort noticing me observing at night, or Leno sketching during the day; but the latter was so well managed that only once were questions asked as to why Leno and the men with him were punished by having to ascend mountains and reach camp after every one else. In order to shelter ourselves from the prevalent strong winds, camp 51 was pitched in a very narrow valley, which rendered the task of measuring bases more troublesome. This, however, was a mere nothing to observing in a very strong and equally cold wind at the hill stations of this camp, when it was necessary for Leno and myself to continually relieve each other, one recording while the other was observing. Even with this division of labour, both of us suffered temporarily from the exposure, but a judicious use of some of the contents of the medicine-chest curtailed the unpleasant effects of the severe weather. Although this camp was only 16,630 feet, nearly all the Ladaki caravan-drivers complained of headaches, etc., which they attributed to the great height, and as they abstained from eating meat until the inconvenience ceased, it was only reasonable to believe their complaints. It is certainly very strange that men who live at heights of between 8000 and 12,000 feet should suffer from the effects of rarefied air when neither Pike nor I, who generally frequent places not much above sea-level, experienced any such symptoms. Owing to the wretched condition of the mules and ponies, and to the scarcity of water, we were obliged to make very short marches. The state of our animals served as an excuse for occasional halts, which were necessary for survey purposes,

to which neither of the guides ever raised the slightest objection; in fact, they several times helped to erect pillars, being quite content with the assertion of the caravan bashi that sahibs do strange things, and that once the all-powerful "hokum" (command) had been given, it was to be obeyed whether its purport was understood or not.

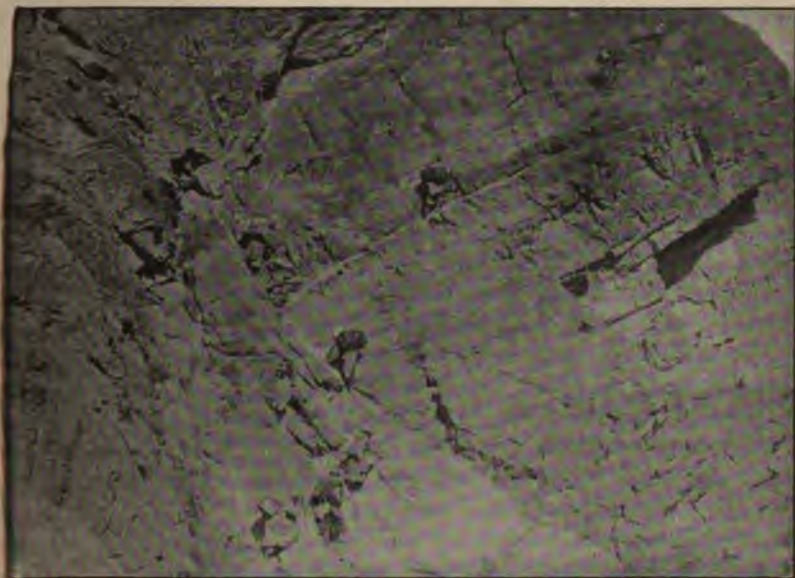
A few days after our Tibetan guard left us, a couple of men arrived with supplies for the guides and with news that two men, who had been wounded near camp 31 by Pike's force, which consisted of only four men all told, had died of their wounds. They also informed us that a large body of chukpas were in our vicinity; whereupon our brave guides, after due consultation amongst themselves, formed up and suggested that we should attack the robbers, whose property was to be divided between them and ourselves. According to their proposition, all the yaks, goats, sheep, guns, and everything else, in fact nine-tenths of the plunder, was to be given to the guides, who would assist the enterprise by remaining in camp, nominally to guard it, while any animals capable of carrying baggage might be retained by us. These creatures seemed quite disappointed when we refused to fall in with their plans, and did not understand that we wished to travel peacefully through the country, and would not attack or punish any one unless we were first attacked or robbed. As soon as friendly relations were established between the guides and our men, who invariably made the former fag for them, every endeavour was made to obtain simultaneously from both men when apart corroboration for the names of places previously visited, as well as the names of camps, etc., on this route. One of the guides proved to be a great acquisition in many ways, and seemed to be most anxious to serve us in every way, so a much greater value was placed on his replies, most of which were, I am strongly inclined to believe, fairly true. As a rule, neither Pike nor I were ever present when the names of places, etc., were asked, as we considered that the Tibetan would be far more likely to tell our Ladakis the true names when neither of us was within hearing. When possible corroboration was sought for names, and when this was not to be had, the replies of whoever had confirmed the statements *re* custom, taxes, etc., of men previously questioned, or who did not appear to have anything to gain by telling lies, were accepted. Though every endeavour to ascertain the real names of places was made, I do not wish to assert that all the names given in my map are correct. Wellby calls the pass, which is designated Napo La on my map, Napula, and the lake on the west side of it, called Dyap Cho by me, Lake Treb, and as it is well known that Tibetans generally give travellers erroneous names for places, I fail to see any reason why the names Napo La and Dyap Cho should be considered more correct than those given to Wellby.

One of the hardest parts of the surveying during this journey was

undoubtedly the ascent to the very high hill station south of camp 57. The exceedingly steep mountain-side was covered with very loose shale, necessitating a great amount of energy and determination in order to reach the summit, where the heavy theodolite was eventually brought, and successful observations carried out. Another drawback to observing was the very high wind, which at times necessitated piling large stones round the legs of the theodolite-stand to prevent the instrument being blown over. The rarefied air, combined with a very low temperature, was a constant cause of delay and annoyance when taking astronomical observations at night, as the candles gave very bad light and continually went out, very often fifteen to twenty times each night. The low temperature not only tended to make the candle stick in the holder, but also froze the ink, which could only be used occasionally and when the inkstand was kept in the lantern, the temperature of which was just high enough to keep the ink liquid. Very often the wind disturbed the compass so much that when setting up the theodolite previous to taking astronomical observations to determine the deviation error, which was repeatedly done, it was necessary to shelter the instrument by means of rugs held up by some of the caravan-men until the needle became quite steady. Though many attempts were made to observe occultations, bad luck, in the shape of clouds, continually proved obstructive, and also debarred me from observing transits of the moon and stars culminating near it. Much as I regretted not being able to take lunar observations more frequently, the omission proved to be of no great consequence, as, thanks to the chronometer watches which were kindly lent me by the Royal Geographical Society, and to "travelling rates" having been several times ascertained, good chronometric values for longitude were obtained. By "travelling rates" I mean rates while travelling between places, the difference in longitude of which was determined trigonometrically as we went on. This method of obtaining travelling rates has, I believe, never been used by explorers in unknown and unsurveyed country. Comparatively narrow valleys, with high mountains on either side, and lakes, mostly salt, scattered about, are the main features of this part of Tibet, but scarcity of grass and water are by no means unimportant minor facts worthy of notice. Judging from the well-defined marks near the west end of Keze Chaka, this lake must have been formerly considerably deeper, and its area proportionately larger.

When approaching camp 67 much curiosity and anxiety were experienced about water, as none could be seen, although a good-sized stream was observed close by from a hill near the previous camp, which was a waterless one. This proved to be an intermittent stream which existed for only about six hours daily, its breadth being about 12 feet, and the average depth approximately 9 inches. Owing to the exceedingly porous nature of the soil, we were not able to store up any water

by damming the river, which for the three days we halted appeared and disappeared daily with the greatest regularity. As soon as it was decided to halt for a few days for survey purposes at Chagnagma, or camp 67, one of the guides was sent on with Ramzan, the caravan bashi, to try and locate Rundor, the existence of which we had begun to doubt. They were successful in doing so, and met us on the day we left that almost barren camp, accompanied by a few natives of the long and very sparsely populated valley whose head is at the Napo La, and which is known as Rundor. Ramzan, who was mounted on my riding-pony, procured a guide and went on ahead quickly to Lutkum, from which place he sent back some transport, without which we should not



DIFFICULT PART OF ROUTE THROUGH HUNZA.

have been able to cross the last two passes and halt at two consecutive waterless camps.

Besides the repeated scarcity of grass, many of the springs by which we had to camp were small and so well frozen that often no water was to be had, so that our wretched animals suffered considerably, and at times one or two would not leave the vicinity of camp for a long time after the loads were removed. On one occasion a fine mule, which had lost less condition than any of the others, and which had invariably carried the instruments, would not depart from the close proximity of my tent until driven away, when she speedily returned, until at length she fell down and nearly levelled the tent in doing so. It turned out that the poor brute was suffering

from colic, which made her frequent the camp; but it was certainly very curious that she returned so often to the neighbourhood of the medicine-chest. I was in great hopes that she would survive the journey; but, although the attack of colic did not last long, she succumbed in about a week afterwards to the effects of great cold and semi-starvation. When we reached Rundor, the pombo, or headman, and many of the inhabitants were away in Ladak purchasing supplies, so it was rather hard to obtain transport to convey our baggage over the Napo La, a pass 18,880 feet, over which, although it was free from snow and the approaches comparatively gradual, our impoverished animals were quite unable to carry even small loads, while one had to be shot near the top of the pass. From the broad valley lying west of this pass there is a magnificent panorama of very high mountains, many of which are perpetually covered with snow, and it was here that a serious accident happened to the theodolite. The wind was so strong at my last hill station that, although stones were piled round the lower part of the theodolite-stand, it was blown over by an unusually strong gust, and so damaged that further work was out of the question. This, however, was not of great consequence, as the surveying had been satisfactorily finished, and the instrument was soon repaired at Dehra Dun.

Altogether about 24,000 square miles of country had been surveyed on the side of 8 miles to 1 inch, and the heights of seventy-nine peaks determined. Triangulation was carried on as far as possible, a 6-inch theodolite being used, and a 10-foot subtense bar for measuring bases by; but, owing mainly to my want of previous practice in this class of work, it was not without breaks, when longitudes were checked either chronometrically or by latitudes and azimuths. The heights are barometric, a Collie's portable mercurial barometer being read twice daily, except when I was laid up with fever, and are based on a series of observations at camps the relative heights of which had been determined by triangulation, and were computed differentially from Leh. As a proof of the great accuracy and skill of Leno, it may be stated that his average error in latitude for each camp was only about one-third of a mile. Since crossing the Lanak La, astronomical observations, including numerous ones to determine the deviation of the compass, were taken at all but four camps. Very careful meteorological observations were regularly taken by Pike, who was of the utmost service in every way, especially in reconnoitring, issuing rations, and looking after the natural history and botanical collections. I have not the slightest hesitation in saying that only for the very valuable co-operation and companionship of Arnold Pike, the results of the expedition in every way would have been far smaller, and I feel that I owe a great debt of gratitude to him for having accompanied me. Although topographical work had now been carried on right up to the frontier, the

journey was by no means ended—three high passes and some almost barren camps had to be negotiated before reaching the few houses at Lutkoun.

Of the sixty-six mules and ponies which composed our caravan when it left Leh in May, only six survived to reach Lutkoun in November, and they were only just able to crawl along unladen. Sheep proved to be the best transport animals, very few being unable to carry loads of about 20 lbs., which were subsequently increased after the loss of the ten mules and ponies. After a few days' rest in Leh, I said good-bye to Pike, who wished to remain some time longer in Ladak for shooting, and, setting out for the Zoji La, which was crossed with great difficulty, reached Srinagar on December 10, after walking 600 miles, mostly in Tibet.

Once again Srinagar was the starting-point, and on September 14, 1897, I set out for the Pamirs, *via* Gilgit and Hunza, as the Indian Government had very kindly given me permission to use that route, thus enabling me to commence surveying a few days after crossing the frontier, and before any heavy snow had fallen. I was accompanied as far as the Taghdumbash Pamir by R. P. Cobbold, who was so much impressed by the tales of excellent shooting related to us by an American named Isidore Morse, who met us close to the Kilik pass, that he was eager to go direct to Kashgar and apply for permission to shoot in the so-called Eldorado of sportsmen in Russian territory. My party consisted of a sub-surveyor and an orderly, both of whom were kindly lent to me by the Indian Government, a cook, a native collector, and six Argoons headed by Abdul Khalik, who was soon proved to be one of the greatest scoundrels and robbers in Central Asia.

Owing to the demand for ponies for the Tirah Field Force, it was very difficult to obtain suitable animals in Srinagar, but this difficulty was removed by Major Yeilding, D.S.O., C.I.E., who rendered me very valuable assistance by hiring some ponies to go as far as the frontier, and in addition twelve mules in charge of four Pathans, who met me at Gilgit. The Pathans stuck to me for six months, and proved such hard-working and faithful fellows, that I parted from them with the very greatest regret. The miserable cowardly liars who came with the ponies from Astor continually gave plenty of trouble, and although they were most anxious, in Srinagar, to be engaged for six months, they refused for some time to go beyond Hunza, until the matter was reported to Captain McMahon, C.I.E., C.S.I., political agent, Gilgit, who soon arranged matters very satisfactorily. The smallness of my own caravan was a source of much unfavourable comment on the part of Abdul Khalik, the caravan bashi, against whom I had soon accumulated sufficient evidence to convict him, while he swaggeringly informed the rest of the caravan-men and others that I was a poor sort of sahib who bought everything

himself, and who had very few animals of his own, and that he could not make anything out of me, whereas from other sahibs he had pocketed large sums daily. This was speedily reported to me, and in a short time afterwards he was, greatly to his surprise, arrested at Gilgit, where, after a very tedious and impartial trial by the wazir, or native governor who utterly ignored the threats to murder me which Khalik made in court, he was sentenced to a year's imprisonment for robbing me. This sentence was afterwards commuted considerably, much to my disgust, as it was well known that he had robbed other Europeans and innumerable natives in the sahibs' name; but then, some native states are by no means hostile to men who would soon be turned out of India. While marching from Srinagar to Gilgit, my orderly, Abdul Karim, of the 3rd Madras Lancers, in answer to my query as to his opinion of the caravan bashi, said, "Sahib, he is a very bad man and a robber; kill him, and then there will not be any more trouble." As I did not at once concur with him, he added, "If you do not like to kill him, give me the order and I will do so at once, then all the trouble will be over." Not wishing to utterly damp my orderly's spirits, I partially contented him by stating that I would make arrangements for the cessation of the trouble in a quieter way.

After a few days' stay in Gilgit, where we were most hospitably received by Captain and Mrs. McMahon, we continued our journey, escorted by the former and the genial and very good natured agency surgeon, Captain Roberts, I.M.S., who most kindly acted as cicerone during the march to Baltit. Captain MacMahon was most anxious for us to postpone our departure from the charming Hunza valley until he could accompany us as far as the Kilik pass, whither he was going on tour; but it was now so late in the season that we were reluctantly obliged to deny ourselves this pleasure, and hasten on in hopes of reaching the Taghdumbash Pamir before any heavy fall of snow had rendered the passes more difficult. On October 22 I commenced work in the west end of the Taghdumbash Pamir, and obtained a good value for my longitude by triangulation, as well as by latitudes and azimuths to some peaks fixed by the Survey of India, but not before my hands were frost-bitten at the highest hill station, which is about 16,000 feet. After spending some days trying to shoot some *Ovis poli*, I moved to Ujadbai and Mazar Sultan, where a halt was made for some days while fresh values for the longitude of my starting-point of mapping were obtained, as I was not quite satisfied with the previous ones. The task of identifying peaks from positions the longitudes of which were not accurately known was rendered still more difficult by being unable to go to a sufficiently high altitude, whence the more prominent peaks could be easily discerned. Deep snow on the higher mountains necessitated lower sites being selected for the hill stations, but even on these the strong biting cold wind was a serious hindrance, not to say discomfort, to surveying

the altitude of 16,000 feet in the month of November. Several of the peaks which had been previously fixed by the Survey of India, and which I was anxious to observe, were not very prominent ones, and in my observing-stations appeared to be so close to peaks of similar height that the slightest movement of the ruler on the plane-table misled them on to other peaks, thus adding great doubt and uncertainty to some of the observations. In order to be sure of obtaining satisfactory results, I four or five times went up to the highest hill station near Bazar Sultan, and, when feasible, camped the previous night close to the foot of the mountain, so that by starting a couple of hours before day-break work might be commenced soon after sunrise, and, if possible,

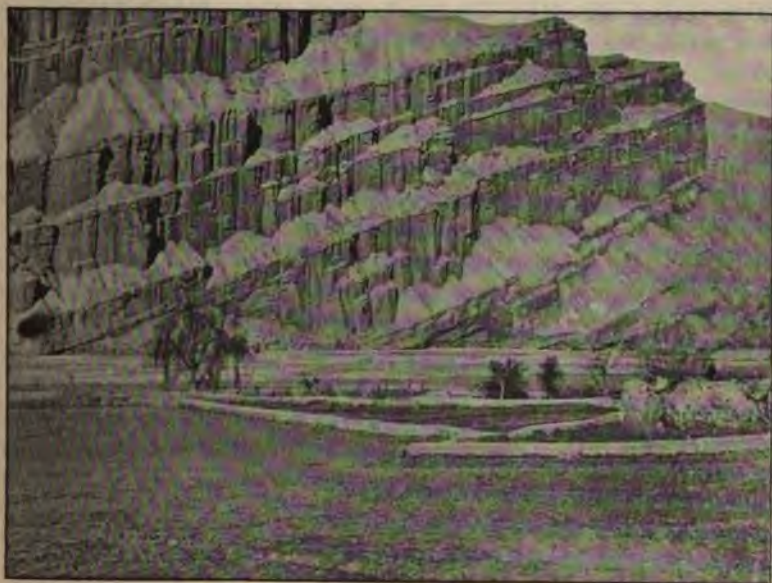


SCENE IN BASKAM.

completed before the strong wind, always trying to the temper, had sprung up. The instruments were carried up the steep mountain-side, which was covered with loose shale and large stones, on a yak, and two more of these most useful and exceptionally hardy and sure-footed beasts transported the sub-surveyor and myself, until the gradient became so steep that it was infinitely preferable to crawl up by hanging on to the yaks' tails than to endeavour to remain in the saddles, which continually tipped back. Much as the ascents were disliked by some, if not all of them, I have no doubt that the yaks resented their being employed in this way, and as a rule required much force, sometimes applied in the shape of a stirrup-iron until it became bent, to make them continue the ascent

even at a very slow pace. However, the results proved satisfactory, the greatest difference between any two of the three values for the longitude of this starting-point was only some seconds, and the height of Muz Tagh Ata (father of ice mountains) was only about 20 feet less than the two values obtained in the next year from the Wachan or Uchi valley. It was during this halt at Mazar Sultan that obstruction from the natives was first experienced. They tried hard to dissuade me from travelling to the valley of the Yarkand river by stating that the roads had become, and still were, quite impassable, owing to earthquakes, that no guides were obtainable, and that nobody would supply me transport to go there. After some delay, one man, who owned to having formerly known the route to the west end of Raskam, was discovered and induced to accompany one of my men as far as the Raskam Yarkand river, in order to see how much of the information already obtained was true. While these two went reconnoitring, I moved camp to Oprang, and sent another man accompanied by a native from there to report on another route to the Yarkand river. The native who accompanied my man Islam assured him that there was no route via the Oprang pass, and did his best to dissuade him from going; but Islam obeyed the strict orders received from me, and reported the route to be quite easy. Cobbold, who had reached Oprang before me, sent back word that it was only about 10 miles from my camp at Mazar Sultan but his estimate proved to be so much below the actual distance, that he did not reach his camp till after eight o'clock at night, while one of my men, who declined to be guided, was rewarded for the exalted opinion he had of his own power of guiding himself to a place whose whereabouts he did not know, by spending the night in the open—a far from delightful experience, as the thermometer fell near zero before morning. At length, the headmen, seeing that I was determined to go to the Yarkand river, arranged for transport, and no doubt issued orders to the men who accompanied it that they were to feign ignorance of the route, as was undoubtedly done. I was for some time inclined to attribute these difficulties to the stay-at-home propensities of the Tajiks, but I subsequently ascertained that strict orders had been sent from Kashgar to the Amban of Tashkurghan to warn the people that no attention was to be paid to the public orders issued on my behalf, and that they were to do their best to prevent me from going to the Yarkand river, but that if I proved obstinate and really meant to go there, then transport was to be provided, but no guides on any account. Curious to relate, two shocks of earthquake were felt the night before crossing the Ilisu pass, into what may be called forbidden ground, whereupon I was greeted with the proverbial "I told you so." It was with rather a considerable amount of surprise that those who thought fit to remind me of their previous statements departed from my tent on being told that they were annoying me exceedingly by preventing me from going to sleep.

The descent from the top of the Ilisu pass towards the Yarkand river is fairly gradual, and a great contrast to the steep and rocky ascent from the north. Unfortunately, the route lay along the bottom of the valley of the Talde Kol Su, which was now frozen hard in the upper part of its course, necessitating the frequent use of pickaxes to roughen the ice, and to improve the track where it was impracticable to closely follow the river, while lower down the jungle was so dense that baggage animals were much impeded, and one of them lost an eye. Finding no suitable camping-ground at the mouth of the Talde Kol Su, we ascended the Yarkand river to Sarok Kamish (? Tugrok), and halted there while I followed the well-marked track which crosses the Topa Dawan and



PECULIAR FORMATION IN ASGAN SAL VALLEY.

leads in the direction in which I desired to go. None of the Tajiks who accompanied me from the Taghdumbash Pamir would agree to accompany me along this track, and as I was dependent on them, it was necessary to ascend the Yarkand river to Bazar Dara, where a messenger was sent to arrange for fresh transport. The mountains on the left bank of the river near Sarok Kamish being far too steep to think of getting any instruments carried up them, I was forced to content myself with those on the opposite bank, which are too low to afford a view of any of the peaks fixed from near Mazar Sultan, thus increasing the difficulties of surveying. The only untoward incident of the march through Raskam was the loss of one pony, which stumbled on a very

bad part of the track and fell on to the rock below, where his load was completely smashed up. Although the river was then very low, the fording of it was not easy for laden animals, and between Surukwa and Bazar Dara the difficulty was increased by the thick slippery ice which extended for several yards from each bank. Here the very necessary pickaxes were in constant use, as passages through this ice had to be cut before the caravan could proceed with any degree of safety. In the march to Bazar Dara the river has to be repeatedly crossed, and as it was frozen over in only two or three places the march occupied very long time. When close to this place, which consists of a small fort with a nominal garrison of twenty Kirghiz and a petty Chinese official, I was greatly amused by Raju, my caravan bashi, strongly protesting against my riding a nearly barebacked pony which I had caught when grazing, on the score that it would be most unseemly for me not to ride my own well-saddled pony when entering Bazar Dara. Owing to the exceedingly high mountains which hem in Bazar Dara at the mouth of the Dozok Dara Su, the task of measuring a base was very difficult, and reaching the sites selected for hill stations proved to be no light one, especially for the men with the yak carrying the instruments. On previous occasions I was struck by the wonderful agility and sure-footedness of the yak, but I was fairly astonished by the way this particular beast got along over ground where the two Kirghiz, who accompanied him, experienced great difficulty.

From Bazar Dara the route lay along the bottom of the exceedingly narrow valley called Dozok Dara, with vertical rock towering above it in many places to a considerable height. The approach to the Kukalung pass was very trying to mules and ponies, the former being undoubtedly by far the worst when marching up the very slippery and sloping ice, which for some distance completely filled the bottom of the narrow valley we had to ascend. The actual pass, though over 16,000 feet, is quite easy when there is no snow or ice on the north side, where the descent for some hundreds of feet is very steep. After a day's rest at Zad, the largest Kirghiz settlement in the Kulan Urgi valley, I managed to hire a few yaks, and started to recross the Kukalung pass, determined to carry the triangulation across it to Zad. On account of the great cold—the minimum thermometer fell to -12° Fahr. on the night of December 14—and the almost total absence of grass where it was necessary to halt on the south side of the pass, yaks were the only animals who could stand the double journey. These useful beasts can easily go for a few days with little or nothing to eat, and their thick coats protect them from the severity of the weather. On my return to camp 24, after a long and hard day's work on the high ground, where there was a fairly strong wind and the thermometer about zero, my beard and moustache were covered with icicles, which had to be melted in front of a small fire of dung and boortza. Feeling doubtful about being

able to identify from Zad the peaks observed at camps 19 and 21, I decided to spend a night close to the summit of the Kukalung pass and devote the next day, Christmas Eve, to measuring a base, etc., at the altitude of about 16,000 feet. Fortunately, we had brought a couple of sacks of dung and boortza to this barren and waterless spot, as the supply of fuel ordered from Zad was never sent.

It is exceedingly hard to state truly which was the worst day devoted to surveying on this journey, but it may be confidently stated that Christmas Eve, 1897, was quite one of if not the worst. The first item of that day's work was to climb up about 1000 feet to a site which commanded an extensive view, and spend a long time in the usual wind, with the thermometer below zero. As soon as the theodolite was packed up, the yak loaded, and a large pillar erected to mark the site, the descent to the other station was begun. Bad as the ascent was, the descent was far worse, the shale being more slippery and the gradient steeper. Owing to dearth of fuel, etc., it was imperative to complete the work at this camp in one day, the consequence being that I did not reach camp in the valley of the Kulan Urgi till about nine o'clock at night, and the men with the yaks much later.

At Zad more triangulation was done, and a last attempt was made two marches further on, but it was now too late in the season to permit of ascending to a suitable height whence the high barren mountains lying between me and the Yarkand river could be plainly seen, so recourse had to be made to observations of moon culminating stars for longitude. Bad weather put a stop to this, and the illness of the sub-surveyor, Dalbir Rai, to further topographical work, so a move was made to Yarkand. From Issok Bulok Agzee, or camp 26, onwards to the Yarkand river, the Kulan Urgi valley is exceedingly narrow, and bounded by precipitous mountains of considerable height. From Tir, a small village a few miles from where the Kulan Urgi river joins the Yarkand river, there is the choice of two routes of about equal length to Yarkand. That leading over the Sandal Dawan being reported less difficult than that over the Kuramut Dawan, I settled to travel by the former. The usual frozen river often proved very difficult for the baggage animals, but the main obstacle was encountered in a spot where the only possible way of getting the animals on was by hauling them up two steep drops of solid rock, where none but men, goats, and mountain sheep could ascend without assistance. A narrow ledge of rock halfway between the very steep parts enabled men and animals to rest before reaching the summit. Many of the animals were got up without much difficulty, but some proved very troublesome, and it was only with very great difficulty and hard work on the part of numerous men that the refractory ones were hauled up without turning somersaults. Needless to say, all the baggage had to be brought up by men, which added considerably to the delay.

About halfway between this obstruction and the summit there is another spot impracticable for laden mules and ponies. As to this fact we had not been enlightened by the Uz Bashi, or headman, of Tir, who returned to his village together with all the other men who assisted in getting the caravan up the rocks, thus leaving us in the lurch. This delayed the march considerably, as there were no extra men to assist, but the descent on the other side of the pass taxed the caravan-men and their charges severely. The gradient is very steep, and a recent slight fall of snow had so covered the rocks, stones, and shale that no track could be discerned, so we had to find our own way down. Men and animals continually fell down, especially at the foot of the very steep part where the narrow valley was for some distance a mass of sloping and slippery ice, on which they had to travel as best they could. We had hoped to reach some inhabited place before dark, but the difficulties of the march necessitated bivouacking on the mountain-side, where there was fortunately sufficient grass and a fair amount of partially dry yak-dung, the only available fuel. The old Pathan, Mohammed Amin, and his section of the caravan did not reach this inhospitable spot till after nine o'clock, having left all the baggage higher up. Wonderful to relate, the barometer, which was carried by one of the Pathans, survived this day's most trying march. The next day dysentery attacked Dalbir Rai, the sub-surveyor, and as little or no milk was obtainable, it was necessary to have him carried to Yarkand, where we arrived on January 20. Almost as soon as he recovered from this attack, rheumatism attacked him in a mild form, no doubt the result of exposure in the mountains. The latter also had its effect on me, and aided by a Chinese dinner which the Amban of Yarkand invited me to, and which was served in an open courtyard with a temperature considerably below freezing-point, proved too much for my constitution, which is not seasoned to a meal consisting of more than twenty-five dishes, washed down by the most evil-smelling hot and raw spirit that my nasal organ has ever been near.

(To be continued.)

THROUGH AFRICA FROM THE CAPE TO CAIRO.*

By EWART S. GROGAN.

THERE is a saying in South Africa that "every one who has once drunk dop (a brandy made in the Cape) and smoked Transvaal tobacco will, in spite of all inducements to the contrary, in spite of all the abominable discomforts inseparable from life in Africa, continually return to the old free untrammelled life of the veldt."

Anything more ridiculous than the possibility of my return to

* Read at the Royal Geographical Society, April 30, 1900. Map, p. 264.

Africa never occurred to me as I wearily munched my ration of everlasting bully beef and rice during the Matabele war of '96, and, after three weeks of dysentery and an attack of hæmaglobinuric fever, I shook my fist at Beira from a homeward-bound steamer, happy in the thought that never again should I set eyes on those accursed sands. Thirteen months later I stood on those same sands with my friend Mr. Sharp, having made up our minds to explore the little-known country between Tanganyika and Ruwenzori, and, if possible, to continue our journey down the Nile. Wars and rumours of wars in many of the countries to be traversed, and Khartum in the clutch of the Khalifa, rendered the success of our enterprise extremely problematical; and as failure is unpardonable, we wisely refrained from announcing our intentions.

From the Cape to the Zambezi is perhaps better known to most English people than many parts of England, and consequently I will pass over this stage, confining myself to a very few remarks on the Gorongozo country of Portuguese East Africa.

The river Pungwe, as every one knows, flows into the channel of Mozambique, forming with the river Busi the extensive bay on which Beira, the port of Rhodesia, is situated. Thirty-six miles in a straight line from Beira the railway crosses the Pungwe to a spot called Fontesvilla, on the right bank. Four miles above this the Pungwe flows in two channels; the left, which is the larger, is called the Dingi Dingi, the enclosed island being about 40 miles by 6. Twenty miles above the lower junction an important tributary called the Urema flows into the Dingi Dingi, bringing down the drainage of the east and north-east slopes of Gorongozo's hills and the drainage of the vast swampy Gorongozo plain; consequently, even in the dry season the Urema has a considerable body of water. Its main feeders are a wide sandy river from the east, and a smaller stream called the Manza, also from the east, and the Umkulumadzi, which brings the main volume of water from Gorongozo's hills on the west. Between the Dingi Dingi and the Urema there is a triangular patch of forest, with a network of deep water-troughs; these, even in Mr. Mahony's time (Mr. Mahony has been in this country for about nine years), were lagoons with much water, and the natives went from village to village in canoes. Now, with the exception of a few deep water-holes, they are dry, the canoes may still be seen rotting on the dry bed, and the crocodiles, the few that have survived, lead a precarious existence in the moist grass that grows along some of the deeper channels. This, coupled with the fact that the swamps a few miles to the north are visibly diminishing, proves that even in this district, remote as it is from the centre of disturbance, there is a constant and rapid process of upheaval.

The quantity of game in all this country is incredible. Crossing the great plain just as the waters were falling and the new grass growing

up, we saw over 40,000 head of game, mainly blue wildebeeste, from one point; and during our stay of five months, besides many fine heads of buffalo and various species of antelope, we shot seventeen lions and captured alive five cubs, three of which are now disporting themselves in Regent's Park. Another curious point about this country is that the Urema, which was till lately navigable for about 50 miles in small boats, is now totally blocked by a vegetable growth similar to the famous Nile "sudd," but without the papyrus, which, I believe I am correct in saying, is practically confined to the Nile system, though there are a few papyrus swamps round Kivu.

We began our real forward movement when we left the Zambezi in October, 1898; thence we travelled by the Shire river to Chiromo, the port of British Central Africa situated at the junction of the Ruu and Shire. Thence by steamer on the Shire to Katunga, whence the road leads overland *via* Blantyre to Matope, as about 120 miles of rapids render the river unnavigable. From Matope to Karonga, at the north end of Nyasa, there is an uninterrupted waterway of about 500 miles. Thus far is merely a question of taking a first-class ticket with one of the rival transport companies, of which the African Flotilla Company, despite the heavy handicap of being late in the field, is rapidly forging to the front.

From Chiromo, where I had to wait for some loads that had gone to Delagoa bay by mistake, I crossed the Ruu and spent some time in exploring the mountain mass of Chiperoni, while Sharp hurried on to Karonga to arrange transport to Tanganyika.

Chiperoni, which had previously, I believe, only been visited by Messrs. Harrison and Kirby, the well-known big game hunters, is 6000 feet high, and a conspicuous landmark for many miles round. The main peak, with a broad terrace 500 feet from the summit, is situated in the east side of a huge basin formed by surrounding peaks, the chief of which is Makumbi on the north-west; the bottom of the basin is a forest-clad plateau about 2000 feet above the surrounding plains. The mass is drained by the Ruu, Liadzi, Zitembi, Machinjiri, and Misongwe, all of which flow into the Shire. The inhabitants, who have a supreme contempt for the Portuguese, their nominal masters, are a branch of the Wakunda, and are possessed of domestic swine and pigeons, and they cultivate the pineapple and rice, besides the ordinary grains of the country, millet and maize. They suffer much from goitre, and I observed many albinos. The results of inbreeding, inevitable from the isolation of families in mountainous countries, such as leprosy and other diseases, are very noticeable.

On arrival at Karonga I found that Sharp had left for Ujiji, to obtain dhows on Tanganyika. After a fortnight's delay in obtaining porters, I followed along the Stevenson road. The march to Kituta, at the south end of Tanganyika, is most uninteresting; however, I broke the

monotony by a short trip with Mr. Palmer, the assistant collector at Mambwe, to the Chambezi, which is the real source of the Congo. This district has been recently thoroughly explored by Mr. Wallis, who laid the results of his experience before this Society. But there was still a portion unknown, the vast swamp that lies at the junction of the Chambezi and its main feeder the Chosi, known to the natives as Luwala. It is a triangular patch of territory of about 1500 square miles, and quite uninhabited, a few natives only coming to fish as the waters recede after the rains. Unfortunately, the rains had broken, and we were prevented from penetrating far into the interior by the depth of water. All the streams that flow south-east from the plateau and fall



THE VOLCANOES FROM LAKE KIVU; VIEW FROM SOUTH-EAST.

into the Luwala, mingle and lose themselves in the swamp, and eventually drain out by the Mwenda.

From Kituta I went to Mtowa, the chief station of the Congo Free State on Tanganyika, by the small steamer belonging to the African Lakes Corporation, while I sent my boys and the loads to Ujiji on a dhow that Sharp had sent down. On arrival at Mtowa I found Sharp more dead than alive with fever, in the care of the late Dr. Castellote, the medical officer of Mr. Mohun's telegraph expedition, who had rescued him from Ujiji, where he had been very ill. Two days later we crossed to Ujiji, and after a few days of the lavish hospitality of Hauptmann Bethe and his colleagues, we collected our safari of 130 Manyema carriers and started up the lake by land. Sharp got a slight sunstroke, and my fever became so bad that we arrived at Usambara more dead

than alive. However, Lieut. von Gravert obtained cattle for us, and a team of boys to carry me in a machila to the highlands of Kivu.

The Rusisi, which flows out of Kivu, empties its water into Tanganyika through five mouths, four of which are close together, while the fifth is close to the north-west corner. The enclosed deltas are very swampy and partly covered by tropical forest, and are said to be the feeding-grounds of numerous elephants, a large proportion of which are reported as tuskless. The northern end of Tanganyika is very shallow; we saw hippopotami walking on the bottom at a distance of at least 2 miles from the shore. The lower end of the Rusisi valley for a distance of 20 miles has risen quite recently, geologically speaking, deposits of shells in a semi-fossilized state being visible on all sides. The valley rises very gradually till 20 miles south of Kivu, when the increase in altitude is very abrupt; though this might be manoeuvred, for railway purposes, by making use of the winding valley to the east. The Rusisi itself has cut a channel through the hills on the west in a succession of rapids and cascades. There are signs of the above-mentioned eastern valley having been the old bed of the river. Immense walls of mountains shut the valley in on either side, walls that continue practically unbroken to the outflow of the Nile from the Albert lake. The Germans have cleverly availed themselves of the opportunity afforded by the five years' chaos on the Belgian frontier. They have pushed three posts forward, two on the river itself, and the third on the south point of Lake Kivu. The latter is at least 40 miles over the treaty boundary. With the thoroughness characteristic of German undertakings, they have despatched Dr. Kandt to investigate the possibilities of the country.

The tail of Kivu is a network of islands, which culminate towards the north in the large island of Kwijwi. The coast-line must be something enormous, rivalling, I imagine, the coast-line of any other water in the world of the same extent. On the east coast two long arms run for several miles inland, and thousands of winding lochs radiate in every direction, dotted with islets and broken up into countless little bays and creeks. The lake is very deep, and contains neither crocodiles nor hippopotamus; this also applies to all the small lakes and rivers in this neighbourhood; but there are enormous numbers of large otters, and the typical bird is the demoiselle crane. Numerous fish resembling a carp are caught and cured by the natives; but there appeared to be no large fish such as are found in Tanganyika. The whole surrounding country is packed with small hills, which appear to have been sprinkled on with a pepper-pot till not a single one more could find room. The majority of them are not connected with ridges of any sort, consequently it is necessary to perpetually ascend and descend; and the valleys, which are very narrow, are often filled with papyrus swamps. The hills are covered with magnificent pasture, which affords grazing

for the large herds of cattle owned by the Watusi. The people are known collectively as the Waruanda, and society is divided into two classes. The Watusi, who are similar to, if not identical with, the Wahuma, are the aristocrats. They are presumably descendants of the great wave of invasion of Gallas that penetrated in remote ages as far as Tanganyika; they are a purely pastoral folk, breeding a long-horned cattle, with which they live, preferring slavery even to separation from their beloved beasts. Two to a hundred of these gentlemen are to be found in every village; they do no work beyond milking and butter-making, and when in need of tobacco, grain, or other necessities, quietly relieve the aborigines of the country, whom they call Wahutu, of what they require. The Wahutu are abjectly servile to the Watusi, but presumably, from the satisfaction that we gave to the inhabitants by a slight difference of opinion that we had with Ngenzi, the satrap of Mukinyaga, not totally in accord with their taskmasters. In the time of the late king of Ruanda there was a very formidable and far-reaching feudal system, the provinces being administered by satraps (native name *ntwala*), who were directly responsible to the *kigeri*, or king, each village being in itself governed by an *mtusi* (sultani), who was responsible to his *ntwala*. All the cattle belongs to the king absolutely, but was held in trust by his satraps, who again parcelled it out among the minor Watusi. The Wahutu appear to be merely hewers of wood and drawers of water, and to be allowed as a favour to assist in the herding of the goats and cattle. A few months before our visit the old king had died, and the kingdom was divided between his two sons, one of whom had his headquarters at the north-east corner of the lake, while the other lived to the east of the highest of the volcanoes.

The civilizing influence of the northern influx is conspicuous in the terracing of the hills for cultivation, rudimentary efforts at irrigation, enclosing of villages and cultivated lands by hedges, and even in the formation of artificial reservoirs with side troughs for watering cattle. The scenery of Kivu is superb, a happy blend of Scotland, Japan, and the South Sea islands. The track we followed often led over hills 1500 feet above the lake, and from some of our camps we looked down on the vast oily expanse of water deep-set in its basin of innumerable hills, dotted with a thousand isles, stretching far away till it was lost in the shimmering haze of the northern shore, where crisp and clear towered the mighty mass of Kirunga, whose jet of smoke alone broke the steel-blue dome of sky. At the north-east corner of the lake the hills stop, and the country slopes gradually from the lake-level to the base of the volcanoes, broken only by scattered dead volcanic cones still perfect in form. The eastern portion of this plain is densely populated, and grows enormous crops of maize, hungry rice, millet, sweet potatoes, peas, beans, and edible arum, wherever there is an open space between the endless banana plantations. The western portion, which has been

recently covered by a lava-stream, is not yet sufficiently disintegrated for cultivation, though it already supports a heavy bush growth which bursts from every crack and cranny in the lava-blocks.

The main volcanoes are six in number, two of which are active; the other four have long been extinct. Owing to the impossibility of obtaining representative names for them—I obtained as many as thirty-six for the highest in one camp—I have ventured to name the most important to prevent confusion. Of the two western peaks, which are sharply separated from the other four, the higher peak, generally described as Kirunga, I have called Mount Götzen, after Count Götzen, who discovered Kivu and made the ascent of the peak to the main crater, which is still mildly active. The second one, which has formed since Count Götzen's visit, I have called Mount Sharp, after my fellow-traveller, Mr. A. H. Sharp. Count Götzen mentions considerable activity on the far point of the north-western ridge, and, according to the natives, two years before our arrival in the country there had been a terrific eruption, in the course of which the volcano formed; its crater appears to be enormous, and must be several miles in extent. The lava flowed in two main streams towards the north, and there was a minor overflow to the south-west. The largest stream flowed down by the *arête* between Mounts Götzen and Sharp, a small overflow running, as I have mentioned, south-west, while the main volume poured down into the south end of the Ruchuru valley, down which it flowed for a distance of about 30 miles, working close up to and filling the small bays of the eastern terrace. Shortly after another wave followed over the same course, leaving a sharply defined terrace when it cooled. Then there appears to have been a terrific vomiting forth of huge blocks of lava and ash, which in places are piled to a height of 30 feet on the top of the main lava-stream. The forest with which the valley was clothed was entirely engulfed in the stream's course, while the forest on the sides was blown down by the attendant whirlwinds. The natives informed me that whole herds of elephants were destroyed; I myself saw the bones of one that had been forced up to the top by the edge of the stream. As far as I could gather, the eruption had been very sudden, but I found it extremely difficult to obtain much information beyond the fact that suddenly there was darkness as the darkness of night, when all became fire, and terrible and wonderful things happened of which there can be no words! As in all things that the native cannot understand, there was a distinct aversion to talking about it; all my questions met with a similar response, and they rapidly changed the subject. The other main stream which flowed down the north-west slope was of enormous extent, but as I merely crossed it, I had no opportunity of accurately estimating the area covered. Besides a small branch about 400 yards wide, the width at my crossing was about 2 miles, and this was well on the slope of the hill; further down, where

it met the eastern main stream, the width of the two combined cannot have been less than 15 miles. In the plain to the north of Kivu, in the pass between the two blocks of volcanoes, and on the slopes to the north, owing to the porous nature of the ground there is no water; yet in spite of this there is an enormous population, the necessary water being obtained by tapping the stems of the banana palms. The moisture is retained by the ground, and consequently the forests that clothe the slopes of the volcanoes are wildly luxuriant and impenetrable to everything but the elephant. When hunting and following close on the tracks of an elephant, we had to cut our way with a native axe, without which no one moves a yard; for hundreds of yards at a time



THE VOLCANOES MOUNT GÖTZEN AND MOUNT SHARP, FROM THE NORTH-EAST.

one never touched the ground, but was climbing along the prostrate tree-trunks and dense growth, which of course the elephant would take in its stride. More desperate work or more dangerous hunting it would be impossible to conceive.

Although the forests were full of elephants, it was only after a week's terrible work that I found; and then I had to fire at him at 2 yards, as if I stepped back I could no longer see him. It was impossible to creep to either side of him, so impenetrable was the undergrowth, and I had perforce to take the shot as it was, or lose the chance. The effect on the sportsman of firing a double 4-bore at such close quarters can be better imagined than described; as for the elephant, I believe he is still running. The next day I followed up another, and, after

knocking him down three times, was furiously charged, and either kicked or carried by the rush on to some thorn tree 10 feet above the ground, my gun being picked up 10 yards away in the opposite direction, full of blood; I could not see him till his head was right above me, when I pulled off both barrels of the .500 magnum that I was carrying; this evidently turned him. I was pulled down from my spiky perch by my niggers, who, seeing me drenched with blood, thought I must be dead, till an examination proved that it was the elephant's blood. On resuming the chase, he got my wind again, but, fearing the charge, merely let off some superfluous steam in throwing trees about, a performance that so impressed me, that I have never tackled an elephant with any degree of comfort since. After ten minutes of this exhausting display he fell down, but pulled himself together again and went straight away, and though I followed him till it was too dark to see, I never found him. We had had neither food nor water all day, and it rained all night, necessitating a hungry and chilly vigil, during which I had ample time for calm reflection—reflection which ended in the conclusion that elephant-hunting in the scale of sports might be placed between croquet and marbles. Sharp, after losing two stone in herculean efforts, never even saw one, and gave it up in disgust.

Of the four main peaks of the eastern mass of volcanoes, all of which are extinct, the highest I have described as Mount Eyres, after Mrs. Eyres, of Dumbleton Hall, Evesham, Sharp's sister, without whose help and encouragement we should have failed to bring our trip to a satisfactory conclusion. The other high peak I have described as Mount Kandt, after the distinguished German scientist, who is making a most elaborate study of the whole region. Nearly every morning there was snow on these two peaks, and the height of Mount Eyres must be nearly 13,000 feet (?), as during my elephant-hunting, when I explored all the north-west face, my aneroid registered on one occasion more than 11,000 feet. Leaving the elephant, I made a rapid tour to establish the identity of Mfumbiro, which is conspicuously marked on most maps, with the height added, and I ascertained for certain what I had been led by the Germans to suspect, namely, that Mfumbiro has never existed outside the imagination of the British statesman. Mfumbiro, it will be remembered, was accepted by us from the Germans as a counterpoise to Kilimanjaro, which we gave to them in our usual open-handed manner in the boundary agreement between British East Africa and German East Africa. The forests of these volcanoes are a branch of the great Aruwimi forest, and the home of numbers of pygmies, who hunt the elephant and search for bees, trading the meat and honey with the Waruanda for grain, spear and arrow heads, and knives; while the Waruanda buy their bows and arrows complete, the dwarfs' work being much superior to their own.

When making the circuit of the two active volcanoes, I had an unpleasant experience with a tribe of cannibals called the Baleka, who made what had lately been a delightful and thriving district most undesirably warm. Their superfluous attentions and the absence of food prevented me from exploring two small lakes that I saw to the west, and from determining whether the large stream which I could see issuing from the southern lake flowed into Kivu or down the other side of the watershed direct into one of the tributaries of the Congo. Four days' continual marching, during which I and my ten boys suffered much from hunger, took us out of the country in time to warn Sharp, who was coming round the south of Mount Götzen to meet me with the rest of the caravan. Joining forces again, we returned through the pass once more, and started down the Ruchuru, or, as it is here called, the Kako valley. The Kako rises on the north slopes of the volcanoes, and, becoming further north the Ruchuru, flows into the Albert Edward lake; hence its headwaters are the true source of the Albert Nile. Curiously enough, the source of the Victoria Nile is only 40 miles south of this, the headwaters of the Nyavalongo, which is the main tributary of the Kagera, the main feeder of the Victoria lake, rising a few miles from Kivu. Thus within six days we passed the two actual sources of the Nile, which, rising close together, but flowing in different directions, enclose such a vast tract of country before they finally merge at the north end of the Albert lake preparatory to the long voyage *via* Khartum to the Mediterranean. The height of the crest of the pass is 7000 feet, and the ground quickly falls away to the north till one drops to the dead level of the vast Albert Edward plains.

When exploring with a small number of followers, I observed some ape-like creatures leering at me from behind banana palms, and with considerable difficulty my Ruanda guide induced one of them to come and be inspected; he was a tall man, with the long arms, pendant paunch, and short legs of the ape, pronouncedly microcephalous and prognathous. At first he was terribly alarmed, but soon gained confidence, and when I asked him about elephant and other game, he gave me most realistic representations of them and of how they should be attacked. I failed to exactly define their social status, but from the contempt in which they were held by the Waruanda their local caste must be very low. The stamp of the brute was so strong on them that I should place them lower in the human scale than any other natives I have seen in Africa. Their type is totally distinct from the other people's, and, judging from the twenty to thirty specimens I saw, very consistent. Their face, body, and limbs are covered with wiry hair, and the hang of the long powerful arms, the slight stoop of the trunk, and the hunted, vacant expression of the face made up a *tout ensemble* that was a terrible pictorial proof of Darwinism. The pigmies are of

similar build, but have the appearance of full-grown, exceedingly powerful men compressed, and with much more intelligent faces. The pigmies are to these ape-like beings as the dog-faced baboons are to the gorillas. Probably they are, like the pigmies, survivals of former inhabitants of the country, the difference in their type depending on the surroundings in which they have had to struggle for existence. The true type of pigmy is a magnificent example of nature's adaptability, being a combination of immense strength, necessary for the precarious hunting life they lead, and compactness indispensable to rapid movement in dense forest where the pig-runs are the only means of passage. While I was with the main caravan I never saw either a pigmy or one of these creatures, and to study them it is necessary to go almost unattended; this obviously entails great risk, and it is consequently very difficult to find out much about them. They both have the furtive way of looking at you characteristic of the wild animal, and though I had one of these curious men with me for a week when I made the circuit of the volcanoes, he would always start if I looked at him, and he followed my every move with his eyes as would a nervous dog; he refused an offer of cloth for his services, and suddenly vanished into the forest without a word, though several times afterwards I found him watching me even when I had returned to my camp on the base of Mount Eyres.

On the last spur of the volcanoes there is a chief called Kahanga, of some little importance, who has, to a great extent, emancipated himself from the yoke of the Watusi; and further down the Ruchuru valley the people are still more independent, till one comes to a thickly populated area two days from the Albert Edward, where the chiefs deny that they owe any allegiance whatever to the Kigeri. The west side of the valley is covered with heavy forest, while the east side is undulating grass land, till 15 miles from the lake, when the country settles down into one vast plain. The Ruchuru here has become almost too salt to drink, and the vegetation changes abruptly in character, the luxuriant forest growth giving way to thorn scrub and candelabra euphorbia, the beginning of the blighted desolation characteristic of the Albert Nile valley—scrub, mimosa trees, fan palm, and euphorbia alternating till the region of the borassus, which begins at the upper junction of the Bahr-el-Giraffe.

Where the Ruchuru flows into the Albert Edward there is a large extent of reedy marsh, peopled by a race of fishermen who appear to be identical with the curious Wanyabuga, who inhabit the similar country at the entrance of the Semliki into the Albert lake. They are both quite distinct from their neighbours, and are now isolated. I am inclined to think that they too are survivors of past races, who are making a last stand for existence in these impenetrable wastes, where, leading an amphibious life that does not bring them into contact with the

re sturdy races who have supplanted them, they may yet give an important clue to the ethnological problem of Africa. Unfortunately, the difficulty of approaching these timid and retiring peoples, and the roughness with which contiguous peoples assimilate the prevailing tongue, the study is one of great difficulty. The lake itself is rapidly diminishing in extent, and it will be seen that our map of the east coast is materially modified the supposed form. Two very recent levels are clearly defined, from which it would appear that the upheaval has taken place in fits and starts. The most recent level would give the lake an additional 120 square miles. The insignificant size of the amphorbia on this level compared with that on the next terrace argues



THE GEYSERS, ALBERT EDWARD NYANZA.

that the last movement has taken place very recently, historically speaking. The vegetation appeared to me to correspond in age to that which I have mentioned as having grown on the great lava-beds poured out by the eruption previous to that of three years ago.

Two streams, the Sasa and the Ntungwe, flow to the Albert Edward east of the Ruchuru, but lose themselves in an extensive marsh. The old lake-bed is rendered impassable by pits of fire, and huge jets of smoke, shooting up from all directions, bear witness to the extent of the volcanic activity. Even to unscientific observers like ourselves, it was evident that the country between Kivu and the Albert Edward is the key to the whole modern geographical and geological problem of Africa,

as probably Ruwenzori is the key to the problem of the past. To summarize: the Rusisi valley for 60 miles is obviously the old lake-bed of Tanganyika. Lake Kivu has been lifted up with the gradual rise centring round and radiating north and south from the volcanoes. The surrounding hills still enclose papyrus swamps at the lake-level, and some of these, having been pushed up by local movement, have become dry lawns.

I can only describe the Kivu region as having the appearance of having bubbled. The north shore of Kivu is flat and slopes gradually up to the volcanoes, sloping down gradually again on the north side, till the dead level of the lower Ruchuru valley is reached—another obvious lake-bed, part of which was drained dry but yesterday. A few small lakelets even are held still on this northern slope, and there are many marshes and lagoons on the dead level. North of Lake Albert Edward we find the old disturbing influence Ruwenzori. But Lake Ruisamba and its surrounding swamps to the east and the Semliki valley to the west carry on the idea. The northern half of the Semliki valley is a dead level with many swamps, and then comes the Albert lake.

The lakelike reach of the Nile, narrowing at the Dufie rapids (another centre of disturbance in remote ages), and again widening till the swamps of the Rohl Bahr-el-Ghazal, Bahr-el-Jebel, and Bahr-el-Zaraf, which can only be adequately described as a reed-grown sea, is a further indication of the probability of an existence of a vast inland sea, or arm of the sea, of which the great African lakes of to-day are but a fragmentary survival.

The east coast of the Albert Edward lake is practically uninhabited; a very few miserable natives live in the dense thickets of thorn bush, and their huts are most carefully concealed. Their staple crop is the sweet potato, and they spear fish and kill an occasional hippopotamus in traps. They complained of having been raided by the people of Ankoli. On arrival at the north end, Kaihora ferried us and all our belongings across the narrow neck of Lake Ruisamba. Their canoes are similar in make to the canoes of the Waganda, but not of such elaborate design, being made of axe-hewn boards sewn together with banana-fibre cord; they are very capacious, and are so well fitted that they leak much less than would be expected from their construction. The Sudanese officer at Katwe entertained us for two days, when, having recovered sufficiently from the severe fever from which I had been suffering, we started for Toro, and six days later arrived at Fort Gerry, the headquarters of the district. There are immense numbers of elephant in Toro, and we went up to the Msimba river, which flows into the south-east corner of Lake Albert, for a fortnight's shooting. Being white men, we had the privilege of paying a £25 licence, which enabled us to shoot two elephants; but our sport was spoilt by bands of Waganda, who had crossed the

frontier and were shooting indiscriminately anything with a trunk, regardless of sex or age. Needless to say they paid nothing. Nothing could be more acceptable than game laws and game preserves intended to restrict the indiscriminate shooting of big game; but before the Government is capable of enforcing them or even of knowing when they are ignored, I think they are premature. Here, to my great regret, Sharp was forced to return home, and I had to continue my journey alone. Thirty of our Manyema volunteered to go on with me as far as Wadelai, and with this reduced caravan I marched by the little volcanic lakes Vijongo and round the northern spur of Ruwenzori to the Semliki valley, which I crossed, climbing up again on to the Congo plateau. Here, on the west side of Mboga, I stayed for three weeks hunting elephant, my best tusks being 98 lbs. and 86 lbs.; these, curiously enough, were obtained the same day from two single-tusked elephants, one being a right tusk and the other a left, and each measured 7 feet 10 inches.

In this country the prevailing type of elephant differed considerably from the Toro and Nile type. Full-grown bulls carrying 70, 80, and 90 lbs. tusks stood no higher than 9 feet at the shoulder; whereas two of the other type I measured were a full 11 feet 6 inches, and several over 11 feet. The ivory was also quite different—the Mboga tusks being long, thin, and almost straight, very white, and free from cracks; as opposed to the curly dull white tusks, covered with small cracks, of the heavier beast. The tusks of the Mboga elephant are set in the skull at a different angle and hang straight down, giving the beast the appearance of having three trunks; while the tusks of the more general type curl out in front almost at right angles.

The Balegga who inhabit the hills to the north, and who were suffering terribly from the effects of the long drought, looked upon me as a great institution, and swarmed down in hundreds for the meat. A weird sight it was. Stark naked savages, with long greased plaits of hair hanging down to their shoulders, were perched on every available inch of the carcase, hacking away with knives and spears, yelling, whooping, wrestling, cursing, and munching, covered with blood and entrails; the new-comers tearing off lumps of meat and swallowing them raw, the earlier arrivals defending great lumps of offal and other delicacies, while others were crawling in and out of the intestines like so many prairie marmots. Old men, young men, prehistoric hags, babies, one and all gorging or gorged, smearing themselves with blood, laughing, and fighting. Pools of blood, strips of hide, vast bones, blocks of meat, individuals who had not dined wisely but too well, lay around in bewildering confusion, and in two short hours all was finished. Nothing remained but the great gaunt ribs like the skeleton of a shipwreck, and a few disconsolate-looking vultures perched thereon.

Returning to the Semliki, I followed the valley down to the Albert

lake, and eventually arrived at the scene of the relief of Emin. Here it was impossible to obtain food; the natives had been raided and shot down by the Congo State soldiers, and had fled to the marshes and reed-beds of the Semliki mouth. After some difficulty, I persuaded them that I was of the same tribe as Colonel Lugard, and being satisfied by the production of his photo, their confidence in me was complete. As this territory is British, the charge against the Belgians is a serious one, and I am perfectly convinced that the gist of their accusations is correct; minute inquiries and cross-questioning failed to detect a flaw, and the tale, which was repeated to me in districts as far distant from one another as Mboga and Kavalli's, tallied in all respects, even in the numbers of women and cattle driven off and men killed. At five distinct villages, three of which were Wanyabuga villages and two Wakoba villages, I was assured that the old women were treated with the greatest cruelty. Three distinct tribes, the Balegga, Wanyabuga, and Wakoba, told the same story. This I considered sufficiently conclusive, as there is very little intertribal communication, and it could not have been "a put-up job," as my Balegga informants were 60 miles away from the others.

The journey up the west coast presented considerable difficulties, as after Kahoma the hills descend abruptly into the water, rocky headlands alternating with semicircular beaches (the deposits of the numerous streams which flow down into the lake). In parts the lake is exceedingly shallow, reeds growing at a distance of 2 miles from the shore; and the deposit brought down by these numerous mountain torrents must be enormous. This coast is of value for the magnificent timber that grows in all the gorges. Transporting the loads round the headlands in two tiny dugout canoes holding one load at a time was tedious work, and I was exceedingly glad to arrive at Mahagi, where the hills recede once more. From Wadelai, the British post on the Nile, I went to Afuddu (opposite Dufile) in a dugout canoe, and thence overland to Fort Berkeley (the old Bedden), our advance post. Inspector Chaltin, the able administrator of the Welle district of the Congo and the gallant conqueror of the Dervishes at Rejaf, kindly took me down to Kero, their advance post on the $5\frac{1}{2}$ parallel, in one of their numerous steel whale-boats. Thence I travelled to Bohr with the Commandant Renier, who was sent to find news of the steamer with Captain Gages, Dr. Milne, and Commandant Henri, which had been away three months on a reconnaissance towards Khartum.

Bohr had been recently evacuated by the dervishes, and the strong fort was still in good preservation. Throwing away everything but absolute necessities, I started with thirteen men on my 400 miles tramp through unknown swamp with many misgivings. The first two days the Dinkas were quite amenable to treatment, having been in contact with white men before. But afterwards I had a very anxious

with the natives, as in places they were in enormous numbers, having never seen a white man, were quite ignorant of his ways, even of the use of a gun. For some distance on the edge of the there is a clearly defined stream, which loses itself in the vast that form near the upper junction of the Bahr-el-Zaraf. winding lagoons run for miles inland. When I passed they were not, but I am inclined to think that they are really the outlets of solitary streams. The number of elephant on the edge of the was prodigious, and they formed a serious impediment to our progress as they refused to move out of the way. Nearly every morning I spent an hour or two shouting and throwing stones at solitary



RUWENZORI, FROM THE WEST.

hunters and herds of younger elephant. One old fellow resented the insult of opprobrium and charged the caravan, but was turned with a shot from my double 303. Banks and banks of hippopotami lay in every direction, but other game was scarce. The mosquitoes were numerous, and rapidly killed off two of my boys who had been sick; the flies by day were even worse.

The Dinkas have enormous droves of cattle, which they value very highly; they never kill them for food, but from time to time tap the milk, which they drink greedily. They are of colossal stature; some of the herdsmen I saw must have been very nearly 7 feet, and in every respect the majority of the men towered above me, while my boys looked like the merest pigmies by their side. They smear themselves with a paste made of wood-ash to protect themselves from the bites of the

mosquitoes, and the long lines of warriors threading their way in single file through the marsh appear like so many grey spectres. They are absolutely nude, considering any sort of covering as effeminate. Their invariable weapons are a long club made of bastard ebony, a fish lance, and a broad-bladed spear, and the chiefs wear enormous ivory bracelets. The southern Dinkas cut their hair like a cock's comb, and the northern Dinkas train their hair like a mop. Both bleach it with manure.

Six days from Bohr the bush recedes 40 miles from the main channel of the Nile, and the swamp appears limitless; even from an anthill 30 feet high I could see nothing but a vast sea of reeds north, west, and south—not even the remotest suggestion of the far bank. At the curve of the swamp, before the dry ground again turns west towards the junction of the Bahr-el-Zaraf, there is a tribe quite distinct from the Dinkas, presumably the Woatsh, of whom Sir Samuel Baker heard rumours. They are much smaller, and are ichthyophagic, possessing no cattle. The whole population of each village turned out in force and accompanied me to the next village, singing a wild ear-piercing chant, and continuously pointing to the sun. I suppose they imagined I had just left there. Some of the villages are far inland, and the women come long distances for water. I met many groups of them filling their pitchers, and they invariably treated me to a somewhat embarrassing dance; it was characterized by the wildest abandon, and terminated in every one hurling themselves in a mass on the ground and then dashing off in all directions into the bush, uttering shrieks impossible to describe. When I showed them beads or cloth and attempted to purchase food, they ran away, hiding their faces, and refused to look at them, thinking they were fetish. Even at night bands of natives would approach and chant to me, so that I was greatly relieved to once more enter the land of the Dinkas, who, even though rather obstreperous, at least refrained from singing. A remarkable thing was the extraordinary manner in which the Dinkas contrived to conceal their enormous herds of cattle until they were quite sure of my intentions; they kept them quiet by lighting small smoke fires under their nostrils, and we often walked right into the middle of a cattle village before we were aware of their proximity. A few miles north of the upper junction of the Bahr-el-Zaraf, a considerable stream flows from the east, which I am inclined to think flows from the marshes in which the Pibro, the large affluent of the Sobat, rises. For 30 miles at least it flows due east to west, and I am sure that it cannot rise in the Gondokoro hills, as suggested by Justus Perthes' map. Any drainage that comes from these hills must, from the contour of the country, flow into the Nile or into the marsh by the long lagoons that I have already mentioned, or down the other side of the watershed into the Sobat. Should my surmise as to the source of this affluent prove correct, the country between the Zaraf and Sobat is an island. The natives at Bohr



THE SWAMPS OF THE DINKA COUNTRY.

assured me that there was no water for many days east, and there was a considerable amount of water coming down the affluent in question. This would suggest that the streams passed by Lupton Bey in his journey east of Lado either drain into the Nile south of Bohr, or, what is more probable, into the marshes of the Pibro.

This Kohr is the northern boundary of the Dinkas. Shortly before reaching it, I was treacherously attacked by the inhabitants of the village near which I had camped. They gave some trouble in camp during the evening, but appeared quite friendly in the morning, and turned out to the number of about one hundred to accompany me on the march, as had often happened to me before. Sometimes there were fully one thousand natives with me; they took me as a huge jest, and wanted to see as much of it as possible. I had noticed that they were crowding round me, when suddenly they started, killed my best man with a spear-wound through the heart, and broke the skulls of two more; the rest threw down their loads and bolted, my small boy with my revolver among the rest. A quick right and left laid out the chief and his prime minister, and I swung round just in time to dodge a spear and to ward a blow at my head from a club, which felled me to my knees. I responded by poking my empty rifle in the pit of his stomach, and the ensuing pause gave me time to slip in a cartridge and finish him. The rest then drew off to about 300 yards, which they evidently considered a safe distance. An enormous man of about 6 feet 6 inches, who had caused most of the trouble in camp, tried to lead them on again, and if he is still alive, he knows more about the effects of a dum-dum bullet than most men. I should much like to have given them a severe lesson, but, as I had very few cartridges, I knocked another gentleman off an anthill at long range; and, having thus given them an idea of the uses of a gun, made forced marches out of the country, fearing that they might return in overwhelming numbers. One of my boys, who lagged behind for a few moments despite my repeated warnings, vanished completely.

The Nuers are similar in appearance to the Dinkas, but rather smaller; they wear iron earrings, some of which were a foot in diameter, and cultivate their hair with the greatest care, binding it up with rings of cowries. Their method of showing respect, as with the Dinkas, is spitting on the object of their attentions. The last ten days of the march were terrible. Far as the eye could reach, one vast shimmering waste of burnt reed, sun-baked mud, and marabout storks; the Zaraf flowing between parallel mud-banks, lined with crocodiles; never a native, never a living beast, with the exception of the dismal hippos, solemn marabouts, and screaming kites; no trees, no bushes, no grass, nothing even to boil a cup of tea; and our diet of hippo meat or pelican steak, with no bread or even grain, was rapidly telling on our health: so that it was a moment of intense joy when I unexpectedly met Major

Dunn, of Major Peake's sudd-cutting expedition, who was up the Zaraf shooting.

It was difficult to realize that it was at last over. From the Sobat to Cairo was covered in a fortnight of wild hospitality, a distance equal to that which had necessitated eighteen months of weary toil. The maps were worked out with a watch and prismatic compass and aneroid; to regulate my errors, I took Usambara, Vichumbi, and Katwe as fixed points. We were unfortunate in having to leave our theodolite behind for lack of transport, and in losing our sextant and boiling-point thermometer in a raid that the Waruanda made on us one night at the beginning of our trip. The exceedingly hilly nature of part of the country traversed added to the difficulty of judging distance covered. However, I trust that the maps will more or less serve the purpose for which I intended them—that of clearly showing what difficulties the railway and telegraph will have to contend with—such as physical features, labour, and supplies. The immense difficulties of transport, and the work entailed in keeping a caravan thoroughly in hand, which is so essential when travelling without an armed force, precluded all possibility of making collections; and our photographic apparatus was spoilt by the negligence of the transport company that undertook its delivery. We are proud to be able to say that on one single occasion only we found it necessary to take food from the natives; they had all fled, and I took out ten men and cut about thirty bunches of bananas. I have always believed that more can be done with natives by tact and firmness than by a display of force, which makes them believe that their country is threatened; and certainly they nowhere imagined that we, with our ten rifles, had any warlike intentions. On only two occasions was I compelled to take life, and that in self-defence when actually attacked. Attacking people in case they may attack you, I have seen recommended, but I think it a superfluous and questionable precaution. Even the people of whom Sir Henry Stanley writes, "Marching to Wadelai would only be a useless waste of ammunition," I found perfectly tractable, and that although they have since his visit been subjected to the disturbing influence of the Belgian raid on Kavalli, and of the twenty rounds that I took with me I found it unnecessary to use one.

Before the reading of the paper, the PRESIDENT said: This evening we have the pleasure of welcoming our young friend Mr. Grogan, who has succeeded in making a most important and interesting journey from the Cape to the Mediterranean. That has been done by him for the first time, and so far as geographical work is concerned, he has much here to tell us, especially in the region north of Lake Tanganyika.

After the reading of the paper, the following discussion took place:—

The PRESIDENT: Mr. Grogan has mentioned to me the immense importance it was to him to have had such a travelling companion as Mr. Sharp, and he felt it as a great loss when Mr. Sharp had to leave him to return by way of Uganda.

We can imagine how important it must have been on such an expedition to have a good, well-trying companion. Mr. Sharp is here this evening, and perhaps he will address the meeting.

Very often great travellers are too modest to address meetings of this kind, but we have present this evening the members of an international convention, which I believe is assembled in London at present in order to take some international measures to prevent the total extirpation of wild animals in Africa; already three, beside the quagga, are extinct. Amongst other delegates we have one of the greatest of African travellers, Major Wissmann, and I trust that he, taking so deep an interest in Mr. Grogan's journey, will address a few words to us.

MAJOR WISSMANN: The only fault I can find with the lecture we have just heard is that it was too short. We should all have liked to have heard more details about these interesting travels and observations. You can imagine how eagerly I look forward to some detailed description, because Mr. Grogan touched, going from the Zambezi to the north of Tanganyika, my tracks of 1881, 1887, and 1892. We may all, I think, congratulate Mr. Grogan on his great ability in dealing with the natives. The idea that first journeys are always the most dangerous is wrong; at least, I have always travelled more safely where no other European or Arab has been before me. The first contact with the new civilization is not always the test for the savages. The way in which Mr. Grogan has travelled through the countries of tribes bearing a very bad reputation is surprising. The famous Mfumbiro, which Mr. Grogan maintains exists only in the imagination of British statesmen, has been found by a German traveller, or rather its name was recognized, because I think Mr. Grogan saw the mountain under another name.

THE PRESIDENT: We have also a very illustrious French traveller present. I am afraid he is not very conversant with our language, but if Captain Binger, who has done so much important work on the Niger, cares to address us in French, we shall be glad to welcome him here this evening.

We must all have listened to Mr. Grogan's paper with great interest. He has made a most remarkable journey; he is the first to go over that enormously long line of country which is eventually to carry a railroad, but I am afraid, from the difficulties he has described, that it will be a long time hence. In the meanwhile, Mr. Grogan has made a most remarkable journey; much of his work is of great interest and new to us, including that swamp he visited on the Chambezi, and the extremely interesting description he has given us of that previously unknown, or almost unknown, volcanic region to the south of the Albert Edward lake. He deserves the greatest credit for the observations he has made, and the care he has taken in making notes of all he has seen of interest to geographers. So young a man—for he is only twenty-five years of age—may look forward to a long career as a geographical explorer. I am sure you will wish me to express to him your thanks for his paper and the interesting photographs; also to express a hope that it will not be a very long time hence before he comes to us with another paper if possible of still greater interest and importance. It will be a very great mistake indeed for us to suppose that there is nothing left to discover. There are vast regions in all quarters of the globe besides the arctic and antarctic regions which are entirely unknown, and I look forward to such young men as Mr. Grogan to vie with the geographers of other countries in exploring unknown regions.

I have great pleasure in conveying to Mr. Grogan the thanks of the meeting for his most interesting paper.

THE PATAGONIAN CORDILLERA AND ITS MAIN RIVERS, BETWEEN 41° AND 48° SOUTH LATITUDE.*

By Dr. HANS STEFFEN.

To return to the lacustrine basin of the Puelo valley, we see that it is confined on its northern side by the snow-clad mountain mass already mentioned, and as yet unexplored; while on its southern side runs, in a decidedly south-easterly direction, the lofty and steep barrier of the "Cordon de las Hualas," the precipitous flanks of which, towards the valley depression, offer a truly impressive sight. They fall hardly short of the perpendicular, and afford a most precarious hold for a scanty vegetation. Enormous masses of rocks detached from its upper parts have been heaped chaotically in spots near the shores of those lakes, where they lie now half hidden amongst the outgrowth of vegetation. The Cordon de las Hualas, crowned by a high crest and snow-fields, keeps on its parallelism with the following part of the Puelo valley, that is characterized by an alternate succession of extensive widenings and narrow defiles between minor chains, this being another typical feature in all the large rivers of Chilean Patagonia. Within the continuous depression of the main valley the river meanders for long stretches between low banks formed by alluvial river deposits, covered with exuberant vegetation. The river-bed is bounded by extensive gravel or sand beaches, and the cliffs of the hills bordering the valley are far enough from the river channel to allow the construction of roads on both sides. There are frequently found amidst those white plains swampy grounds, bare of trees, or partly covered with bushes of scanty ciprés and slim bamboos; those swamps are called in Chile, "ñadis" or "trapanes," and their origin is explained by the deficient sloping of long stretches of ground, underneath which there is an impermeable layer of subsoil, this preventing the drainage of the water accumulated by the incessant rainfalls. The alluvial fields at the river-sides often show evident indications of their being covered by the great floods which, we have evidence of it, sometimes rise as much as 15 to 20 feet above the regular summer level of the river. This is obviously a great drawback to the agricultural use of such lands; but there are also extensive plains of gentle slope, and sufficient altitude over the river, to be out of the range of floods.

These plains, called "llanadas" by the Chilotes, are frequently, as in the Puelo valley, of such an extent that inexperienced people getting sight of them from a low point of the valley have been led to

* Read at the Royal Geographical Society, March 19, 1900. Map, p. 140. It is hoped to publish a more detailed map in a future number. Continued from p. 38.

believe that they were nearing the borders of the Cordillera, the eastern ranges of which are sometimes barely seen on the distant horizon of these plains. They are covered by extensive forests of high trees, among which are to be found, besides those growing near the coast, as the groups of *Myrtaceæ* and *Cupuliferæ*, certain species that do not grow on the coast, as the *Libocedrus chilensis*, commonly called "Cedro" or "Ciprés de la montaña," and the timber of which is particularly valuable for the construction of buildings, ships, etc. Under the lofty trees grows the dense underbrush, mainly composed of "colihuales," so thickly pressed sometimes that they do not allow any other vegetation, the fallen leaves being then the only clothing of the ground. Some of these colihue-bamboos are 25 to 27 feet high, and 4 inches round their base. Beautiful creepers (*Mitraria*, *Boquila*, *Luzuriaga*, etc.), with white or red flowers, are entangled between the trees, rendering the march very troublesome. When the colihuales are not so thick, the ground is carpeted by a deep moss covering, saturated like sponges with rain-water, and a profusion of ferns, amongst which the *Alsophila pruinata* is conspicuous by its colossal dimensions, break the monotony of the forest. Day after day we marched on level ground, the sombre cover of the evergreen foliage of the trees allowing but little of the daylight to pass, and where the abundance of moisture prevents the evaporation and permeates the air with an intense smell of dampness proceeding from the numberless fallen tree-trunks in course of decomposition, and from the dense layer of decayed leaves and mould covering the soil.

The transition between the orographical characters of the broad parts of the valley and the narrow is usually rapid, and this happens at the intermediate course of the Puelo valley. The traveller finds himself of a sudden at the entrance of a darksome defile with perpendicular walls, the minor windings of which correspond to the rocky spurs encroaching on the river-bed from each side. The advance by land in such defiles would meet with insuperable obstacles, as there are such tight places that even the most skilful mountaineer would not be able to find his way by the steep sides that confine the river. These narrow parts would form insurmountable obstruction if the borders or cliffs reached a considerable height; but as a general rule their upper part does not rise more than 200 to 300 feet above the river, being formed by plains, as an extension of the "llanadas" of the wider valley. The path must be looked for then, making a *détour* by these upper parts, and to arrive there it will sometimes be necessary to go up and down secondary spurs, and to cross over ditches and torrents on their way down from the upper terrace to the level of the river, which is frequently reached by the waters in the shape of a cascade over the cliff border.

An interesting feature to be observed in the forms of this inter-

diary part of the valley are the gravel and pebble-stone terraces that lie with some interruptions, forming successive steps; these traces are evidently the remains of deposits corresponding to the various levels of the river course at former periods. At some places where the Puelo valley is remarkably wide, as at that called "Cordeles" by us, the successive terraces are outlined with surprising regularity along the slopes confining the circus-like enclosure of the valley. On different levels may be detected from afar, their perfectly horizontal lines contrasting visibly with the rugged outline of the surrounding mountains. In some other valleys, as in that of the Cisnes river, which will be described further on, and in the Corintos valley, tributary



RIVER AISEN NEAR ITS MOUTH (LOOKING WEST).

the Futaleufú-Yelcho, the successive terraces are so regularly heaped that they look like a railway embankment in course of construction. The Patagonian Cordilleran valleys offer thus many instances of a phenomenon that has been the object of much study in the Alps, Pyrenees, and other mountains of the Old World; in both cases the explanation is to be found in the periodical accumulation of increased deposits at the time of greater glacial activity and their subsequent clearing out by the streams. We have observed in this respect an interesting fact in the Puelo country; it is that the remains of those terraces are precisely found in such places of the main valley as lie directly down stream of the mouths of the tributary torrents into those Cordilleran depressions, where the bordering mountains show actual glaciers which still contribute to swell the volume of waters of the main river.

We must make here some remarks about the orographical forms of

the part of the Cordillera that we have reached through the course of the Puelo valley.

We have mentioned the high barrier of the Hualas range, which lies along the southern side of that valley, and extends without a perceptible break over 50 miles in a south-easterly direction, until it is knit together with the powerful mass of andine mountains, 6000 to 8000 feet high, that surround on the southern side the Lake Superior basin, which must be considered as the main receptacle of water feeding river Puelo. Three or four rivers of some importance breaking down through the ravines of the Hualas range to join the Puelo, show by the aspect of their waters that they originate in snowfields and hidden glaciers of interior slopes and depressions within the mountains. On the opposite northern side of the Puelo valley there is no consistent range of such continuity as that of Hualas; the transversal valleys and depressions of the Cordillera are here deeper and of a more marked character, chiefly that of the Manso valley joining at a straight angle the Puelo depression. The whole piece of land enclosed by the northern course of the river Manso and the central Puelo valley is an entanglement of mountain masses and groups, where it would be utterly impossible to point out anything like a predominant chain in a meridional direction. Towards the Manso side there are but middle-sized hill chains, not over 5300 feet high (Cerro Mirador) of irregular and flat shapes; it is only towards the south and south-east that consistent though longitudinal short ranges are outlined, showing their dentallated crests above the snow-line. Amongst those it is worth mentioning, the "Cordon de la Sierra" running some 15 miles in a south-easterly direction in front of the Hualas range. Somewhat to the east of the Sierra range, but divided from it by deep ravines, lies the conspicuous "Serrucho" (Saw) group of an altitude over 8200 feet, and the more prominent amongst some five or six lofty massives with battlement-like cliffs, heaped up one upon the other over the lower slopes, and in some way connected with each other by much-crevassed secondary ranges. The latter series of groups is the only one in this region stretching longitudinally to some extent, this being little more than 20 miles from north to south; but we must observe that it is in no manner orographically connected with the Cordilleran ranges, nor with those situated to the north of the Manso valley, neither with the Cordon de las Hualas and the Andine masses lying at the south of Lake Superior.

When the grand panorama of these Cordilleras is surveyed from a prominent summit, its salient outlines show the pointed peaks and saw-teeth shaped needles frequently repeated, as probable indications of an identical geological formation. Other crests take the form of church towers and bastion-like walls, at the foot of which there is hardly any place for the accumulation of perpetual snow. Generally speaking, the western slopes are of a more abrupt character, mostly composed of bare

in accessible rocks, while the eastern declivities contain some snow-fields and hanging glaciers. The aspect of the intermediary Puelo and Manso Cordilleras is rendered extremely desolate by the destruction of the forests that have been consumed some ten years ago by enormous fires, proceeding doubtless from the east.

It is difficult to imagine the immensity of the vast sea of flames driven with irresistible force by the eastern winds, consuming the forests and underbrush of the valleys and surrounding slopes until it was stopped by the coast forests impregnated with moisture. Crossing over rivers and even minor lakes, these conflagrations progressed rapidly through the cedro woods on the level tracks of the valley, where large amounts of these valuable trees have been destroyed. I have observed in all my journeys through the Patagonian Cordilleras vestiges of fires, some of which had taken place at very remote periods, and were only detected by the presence of a few carbonized trees among the new vegetation, and others more recent, while some were still in actual progress.

It is certain that the origin of those conflagrations lies in the subandine region which forms the transition between the forest-covered mountains of the interior parts of the Cordilleras and the open Patagonian plain that begins at the Lake of Nahuelhuapi, and are extended without interruption towards the south. As there is no impediment for the communication between this intermediary region and the Pampa lands, frequently visited since former times by nomadic Indians or settlers, always drawn by the natural riches of the eastern Cordilleran valleys, it cannot be doubted that such fires were caused by men, either intentionally or by sheer negligence. From the subandine valleys these fires have progressed, following the large transversal openings, by the forests of the intermediary mountains without reaching, as it seems, any point of the seashore.

We have crossed through the more compact mass of the Cordillera guided by the course of a main valley, and have arrived now at that more open region which we have already qualified as subandine, the most remarkable feature of which is the existence of spacious valleys, partly occupied by extensive pampas and partly by lakes or lagoons, drained almost without exception by the main rivers to the Pacific. In the region we are dealing with, this type of valleys is represented by the "Valle Nuevo" or "Valle Florido," stretching northwards from Lake Superior at the eastern base of the longitudinal series of mountains referred to before, nearly as far as the borders of the Upper Manso valley, that is to say, some 25 miles' distance, and confined at the eastern side by ranges of medium height. Although there is no doubt that the "Nuevo valley" ought to be considered as a Cordilleran valley; the feature of the landscape is, however, considerably different from that of the valleys close to the Pacific. In the first place, there is a marked diminution of atmospheric moisture, and, as a consequence, there is

a partial substitution of the dense and darksome forests by open fields, their vegetation being of a similar kind to that of the grassy plain lying at the east of the dividing ranges. Notwithstanding, the rains are still frequent, and at the winter season the valleys and hills are sometimes covered with snow for several days. It is not an unrecorded occurrence that furious rain-storms from the west and north-west then pour down on the littoral, find their way through the wide opening of the Puelo valley headwards as far as the Nuevo valley region; it being usually the case, however, that the heaviest downpour occurs on the coast mountains, and only the last showers fall eventually on the upper valleys.

The advantageous topographical and climatic conditions of Valle Nuevo have been for several years past a powerful attraction to the incoming of settlers. We found there, in 1895, some families of Chilean origin, who had crossed from the Argentine side and gradually taken possession of what to-day are flourishing cattle-farms. There is no doubt that the boundary question between the two countries once settled, the Nuevo and Upper Manso valleys would soon be the site of important colonies. Besides, traces of ancient settlements are not wanting, being very likely Indians who retired backwards as the new settlers were advancing; we have been confirmed in this supposition by the discovery of a large number of wild cattle which we found isolated in a corner of the Manso valley, far off from any human habitation.

As I have already said, Nuevo valley is fully included in the Puelo basin, which even penetrates between the ranges, partly high and well defined, that form its divide from the basin of the Argentine river Chubut. These mountains are mostly bare or covered by bunches of the predominant *Graminea* of the pampa, called in Chile "coirón" (*Festuca*), and of an *Umbellifera*, equally characteristic of the Patagonian uplands, the *Mulinum*.

It would not be correct to speak here, any more than in many other parts of the Cordillera, of a continuous water-parting range between the Chubut and Puelo basins, though some ranges of a certain extent and successive summits rising above 6500 feet, occasionally coincide with the divide. The continuity of such ranges is usually broken by cols or depressions more or less wide and flat, and even the divide does not keep long over the same range, but runs from one to another parallel to it, either descending to an interposing depression or crossing over by a connecting link of hills.

One of the most typical among the latter depressions is the pass communicating the Quemquemtreu river valley that slopes down to the Valle Nuevo with the Maiten and Chubut valleys. The height of the pass being 2550 feet above sea-level, there are 1430 feet to climb from the bottom of Valle Nuevo, while there are only 230 feet to come down to the Chubut river side. These figures show the great disparity of

Level between the main valleys at either side of the water-parting line; we see that at certain places the divide is not very prominent over the level of the high pampas bordering the eastern slopes of the Cordillera; but it is not to be taken for granted that this is usually the case, as out of about 65 miles of the Puelo-Chubut divide, between the latitudes of $41^{\circ} 30'$ and $42^{\circ} 10'$, nearly 50 run over high ridges and peaks, as the "Cerro de la Carrera" (7630 feet), "La Sierra" (7440 feet), "Cerro de Pillaquitrón" (7130 feet), these being the culminating points amongst several rugged ranges of old plutonic formation. About the latitude $41^{\circ} 30'$ another longitudinal range becomes detached, and runs south at the east of the Chubut valley with slight interruptions as far as



RIVER MAÑUALES NEAR ITS ORIGIN (LOOKING NORTH).

lat. $42^{\circ} 20'$, where this river alters its course decidedly to the east towards the open plains of Patagonia.

The description that has just been made of the different aspects and features that are successively presented to an explorer of the Cordilleras when he crosses them at the Puelo region, might be more or less applied as a typical one to the other valleys and mountains extending to the south. I will, therefore, only point out the broad structural lines and the most interesting and practical features of the rest of the vast country over which our explorations have been effected.

The next large river draining a considerable area to the Pacific between the parallels $42^{\circ} 20'$ and $43^{\circ} 25'$, is Rio Yelcho, being the same as was known in its upper course, several years before its lower course was discovered, under the name of "Staleufú" (more properly spelled "Futaleufú"), which in Araucanian dialect means "The Big

River." The true connection between the upper and lower courses just mentioned has only been established a year ago by the explorer Dr. Paul Krüger, then attached to the Chilean Boundary Commission; while the Upper Futaleufú basin discovered by Colonel Fontana in 1885, had been partly surveyed in 1896 by Mr. Waag and others of the Argentine Boundary Commission, and one year after by Dr. Krüger and companions, who crossed over to this basin from the Pacific coast by the Reñihué valley.

The large Yelcho-Futaleufú basin surrounds by the east and south that of Rio Reñihué; the latter as well as the lower Yelcho course running in the north-westerly direction, which has been observed before to be that of the most important structural lines in Western Patagonia. The Reñihué valley lands are not of any special value, their soil being mostly volcanic detritus proceeding from the Minchinmávida volcano, the northern slopes of which form the borders of the valley. The river Reñihué is of a torrential character and not fit for navigation, and the way to its headwaters is intercepted by a lake surrounded by steep-sided hills, leaving no possible path.

A secondary pass, some 3200 feet over the sea, leads from the Reñihué headwaters to a complex system of Andine lakes lying eastwards, and only at about 1600 feet above sea-level, all of them drained by the river Futaleufú, the course of which is here southerly by some 35 miles, between snow-covered ranges of mountains, stretched in the same general direction, but amongst which we should not venture to single out one as the main or principal range of these Cordilleras. The Futaleufú valley and its numerous branches between the mountains contain extensive and fertile lands well adapted for settlements, and especially for cattle farms. Some parts are particularly valuable on account of large *alerce* forests, where some trees are found of 10 or 12 feet diameter, and many thousands from 4 to 6 feet. Cedros and other useful timber are also abundant. By a well-conducted development of these riches it would be possible to make use of the river Futaleufú and its tributaries to carry down the timber and to collect it in the lakes interrupting the river course.

Among the longitudinal chains bordering the Futaleufú valley on the eastern side, the most conspicuous is "Sierra Manuel Rodriguez" ("Rivadavia" of Argentine maps), which extends from north to south some 20 miles, with peaks rising more than 6500 feet above the sea, and is bordered towards the east by another longitudinal depression of the Cordillera where runs the Perzey river, tributary to the river Futaleufú, through the river Corintos. To the east of the river Perzey stands the divide range from whence the waters are drained to the Chubut system. This range runs without break between parallels $42^{\circ} 54'$ and $42^{\circ} 20'$, its summits rising from 4000 to 7100 feet above the sea; its southern part is called "Cordon de Esquel," and the northern one "Cordon de Lelej,"

in conformity to the names of the streams flowing eastward down its slopes.

Towards the latitude 42° 20' we arrive at a curious break in the orographical connection between the dividing ranges. The deep and wide breach through which the Chubut river diverts its course eastwards is interposed between the Lelej range and that bordering Chubut valley to the east, and the continental divide is laid down, across undulating hillocks and grassy grounds, at an altitude of 2300 to 3000 feet over sea level, for some 18 miles, till it rises again to the crest of the northern ranges already described. This low part of the divide obliquely crosses the long depression that as a southerly extension of the Upper Chubut valley penetrates into the Cordillera as far as the Upper Futaleufú lake basins. Where the divide crosses this depression, begin the headwaters of Cholila valley, drained to the Futaleufú, that competes as to its favourable conditions for settlements with Nuevo, Perzey, and other subandine valleys.

All explorers who have visited the region of the beautiful subandine basins, with their large valleys, their various lakes and their glacial and fluvatile deposit terraces, have gained the conviction that they were within the precincts of a vast ancient lacustrine basin, and have advanced more or less well-founded opinions about its extension and the geological causes which have produced the actual conformation of the ground and its water-parting anomalies. There is no doubt that all these subandine valleys lie within the precincts of ancient glaciers, as the terraces and transported materials heaped up on the valley borders tend to prove, as well as the old moraines, forming now long series of hillocks, and the erratic boulders scattered irregularly over the country. Consequently, to explain the actual conformation, the activity of the glaciers, which have been at work for a long time, ought to be taken into account; but there is no doubt, at the same time, that the main cordilleran depressions coincide with early erosion valleys, that were laid out beforehand, so to say, along the tectonic lines of the primary Andine system, and are occupied to-day by the great water-courses, as the Puelo, Yelcho, etc. Into the east of these valleys, that by the effect of retrogressive erosion had branched up eastwards through the more compact masses of the Cordillera, commonly known as its central range, the glaciers found an easy way at the ice period, when the enormous heaps of ice blocked up at the back of the barriers of detritus accumulated by the erosive forces dug down and widened their bottom, leaving in their places, after the thawing of the ice, the primary lakes of the subandine region. These lakes drained towards the Pacific, as the previous slopes of the valley trend that way, and the augmented force of erosion worked also from this side. It is not, moreover, to be denied that, in certain cases, the latter force has been able to capture for the western basins streams and waters primarily flowing to the east, although positive and frequent

instances of this are only found much farther south, towards Lake Buenos Aires and San Martín.

To return to the river Yelcho-Futaleufú, there is still to be said that its lower course is interrupted by a beautiful lake 15 miles long in the north-westerly direction, which is the bearing of the principal axis of the valley. It has been ascertained that all the Yelcho lower course, including the lake and nearly 10 miles headwards, that is, for more than 50 miles in the aforesaid direction, is a good waterway. Its southern border is backed by snow-clad ranges and glaciers, dividing it from the Corcovado valley, both depressions keeping a very close parallelism to each other.

The middle course of the river Yelcho is through another depression, that corresponds to a different system of structural lines in the Cordillera, as frequent as the first, their direction being north-easterly. This part of the river course is of an impressing, torrential character, and forces its way through a long series of narrow defiles, amidst the walls of which the waters rush, forming rapids and cascades. These narrow places occurring in the river course do not affect, however, the conformation of the main valley, which maintains its width of from 1 to 2 miles and contains wooded plains stretched at a level 300 to 600 feet higher than the river bed, and over the low range of hills, the cliffs of which are the walls of the defiles. It will be apparently easy to clear a path on the northern side of this part of the valley, very rich in cedro trees, for some 40 miles, where it should meet the actual trails frequented by the settlers of the "16th of October" valley.

Very little is known about the vast extent of Cordillera enclosed by the Reñihué, Futaleufú, and Yelcho valleys beyond the towering Minchinmávida peak; so that we do not think it justified to draw up precisely on this blank a main chain of the Cordillera, as Argentine geographers would have it.

The best known among the subandine valleys tributaries to the Futaleufú is the "Valle 16 de Octubre," where a few hundred Welsh settlers are apparently thriving in the land and cattle-farm business. The particular conformation of the divide on the borders of subandine valleys, where wide breaches are filled up by glacially produced hillocks, occur again between the $42^{\circ} 54'$ and $43^{\circ} 30'$ parallels, where the water-parting between the Corintos and Teca valleys takes place, the former a tributary of the Futaleufú, and the latter of the Chubut basins. The flat depressions, the largest of which bear the name of Súnica Paria (2000 feet above sea-level), break the continuity of the dividing ridge at the south of the Esquel range, as an encroachment of the Esquel plain, where incomplete rivers and undrained lakelets are found, up to the upper swelling of the land, from where some small streams find their course down to river Corintos. However, at the north-west of Súnica Paria the water-parting takes place on the summits of the Pico Thomas

massive (5550 feet), and to the south of the same, from the Cerro Teca summit (4820 feet) by the mountain-range bordering the basin of lake-let Cronómetro to the east and the rugged Caquel range, that ends up at the Mount Cutch summit rising 6600 feet above sea-level. The Teca valley stretched between the Caquel range and another meridional and extended range that rises up to about 5000 feet above sea-level, is covered with wide pasture-fields, and at its bottom lies the well-trailed road leading to Nahuelhuapi, along which have been erected many settlers' and traders' dwellings.

The river Palena, to which we come next, has been known for more than a century. The expedition undertaken by me in the summer



BAKER CHANNEL, FROM A HARBOUR IN ITS CENTRAL PART (LOOKING SOUTH-WEST).

of 1893 to 1894, the two sections of which coming from opposite sides effected a junction on the river valley, dispelled all doubt as to the identity of the Palena river of the Pacific coast with Colonel Fontana's Carrileufú. We should mention that the latter has retained up to this date the name of "Rio Corcovado," that had been also originally given to Futaleufú river in the erroneous belief that it was the upper course of the Chilean Corcovado river.

The lower course of the river Palena runs tortuously with a great volume of swift water in a wide alluvial valley lying to the west-north-west nearly up to its confluence with its first large tributary, the Claro, the valley of which, occupied by large lakes, runs in a similar direction. The river Palena comes here from another depression almost

at right angles with the first one, presenting another instance of the disposition already observed in the primary structural lines of the Cordillera. The valley itself maintains its width of 2 to 3 miles, but the river-bed is obstructed by the rocky walls of low hills filling the bottom of the depression, owing to which a long series of very dangerous rapids is formed. By a northern extension of this second depression, another tributary, Rio Frio, comes down; its volume of water is large, and it is turbid and remarkably cold, as the chief sources originate in the extensive snow-fields and glaciers of the rough ranges rising at either side of the valley. By the combination of our survey of the river Palena and those of the Yelcho and Corcovado valleys, we arrive at the very probable conclusion that the Rio Frio depression is an extension of that one where the middle course of the Yelcho lies; this would also explain the persistency displayed by the Argentine explorers engaged in ascertaining the hydrographic relations of the Futaleufú, in affirming the identity of the latter with Rio Frio, and its being, consequently, a tributary to the Palena basin. The greater part of the water of Rio Frio seems to proceed from a north-western branch, the headwaters of which are collected on the snow-clad mountains forming the divide with the Corcovado headwaters, and from the volcanic group of Mount Yanteles.

Higher up from its junction with Rio Frio, the Palena, which may retain its former Indian name Carrileufu (Green River), runs into another depression of the Cordillera in a north-easterly direction, its spacious valley presenting alternate plains thickly wooded, and narrow defiles, sometimes assuming the aspects of canyons with perpendicular walls of moderate height. On the upper terraces of those banks a road communicating with the coast might be constructed by the northern side, the only difficult place being the crossing of Rio Frio by reason of the considerable and changeable volume of its rushing waters. Besides, the lower Palena is navigable even by steam launches up to the Rio Claro junction, about 23 miles; and at its mouth the river is connected by two arms flowing through the alluvial banks of Isla Leones with a very good harbour of the fjord, called "Estero Pichi-Palena." The main value of the Lower and Central Palena lies chiefly in the extensive plains of its valley, that properly managed could be converted into pasturages and farms. The forests show already a decrease in the valuable cedro timber, though the upper and interior valleys still contain a considerable quantity of that wood.

Like the formerly described main fluvial arteries, the river Palena has extensive subandine valleys of a much greater practical value for settlements than the coast and intermediate valleys. Such are the so-called "Valle Frio," a northern tributary, and the upper Carrileufu valley (locally known as "Corcovado"), from its exit from Lake Palena (or General Paz) down to its junction with Rio Las Casas (or

Huemules). Both valleys are bounded westwards by powerful masses of Cordillera yet unexplored, and eastwards by lesser ranges that in places are so depressed and flattened, that the continental water-parting is effected in swamps or marshes instead of on a well-defined ridge. That happens at the divide between the headwaters of the river Las Casas and the river Teca, where the cases of Cholila and Súnica Paria are repeated; this is the place called Weckel by Captain Musters in his famous excursion where he came to hunt wild cattle with the Tehuelche Indians, whose fellow-traveller he had become. He says in his narrative* that he crossed the watershed, and undoubtedly he was the first white man to do so and reach the Palena basin.

The region close to the divide by the eastern side is likewise occupied by subandine valleys extended meridionally, bordered by well-defined ranges of an Andine character as it seems to us impossible to deny. We have mentioned already the Upper Teca valley, the southern extension of which is easily recognized in the Putrachoique and Chergue valleys, both tributaries of the river Jénua, a branch of the Senguer. The bordering ranges, stretching without a break from north to south, do not certainly present an aspect so impressive as the snow-clad mountains near the coast, this being due to their initial base-level being very much higher. The range called "Serranía de Tepuel" shows, however, at the east of Putrachoique valley, numerous rugged peaks rising 4300 to 4900 feet over the sea; and its southern extension, the Chergue range, is not much lower. The eastern slopes of these ranges descend gradually, merging into the Patagonian plains, the aridity of which offers a remarkable contrast with the rich lands of the subandine valleys.

The region where this water-parting is effected, being confined towards the east by the Tepuel and Chergue ranges, is included, according to our opinion, within the Andine orographical system, and in that part of it which we have designated under the special term of subandine. Near the 44th parallel the divide comes over a high and well-defined ridge (4600 feet), parting the waters flowing through the Ñirehuau towards river Chergue from some streams, tributaries to the Carrileufu. In its progress to the south the divide goes down over undulating hills to 2840 feet, and rises again to about 4000 feet at the "Loma Baguales," where surge some of the sources of the river Pico, probably the upper course of the river Claro, the affluent to the Lower Palena.

We should remark that the interior of the vast Andine region around which winds northwards the Carrileufu-Palena, and through which passes the Pico-Claro river, remains up to this day a *terra incognita*, only some prominent peaks, as Mount Serrano, Maldonado, and others having been sighted by the explorers. Their outlines show a remarkable

* At Home with the Patagonians, by G. Ch. Musters (London, 1871), p. 148.

resemblance to each other, being cut by deep breaches or ravines; and in their geological formation granitic rocks predominate, with isolated norites and diabases. Along the middle course of the river, as far as the confluence of the Carrileufu and Rio Frio, the granites alternate with quartz-porphyrific rocks, and farther up, where the canyon-like channel begins, we found banks of a hard blue-grey limestone of probably Mesozoic age.

While the Lower Palena waterway was already known by the eighteenth century missionaries, it is only very recently that information has come to hand about the next large Patagonian river on the west side, that empties its waters by $44^{\circ} 50'$ S. lat. in Poyehuapi Inlet, which, together with Cay and Yacaf channels, run between the mainland and the mountainous and well-wooded island Magdalena. Captain Simpson, in a reconnoitring expedition along those channels, saw the mouth of that river, to which he gave the name of "Cisnes," on account of the large number of swans he found on that place. The river itself has remained entirely unknown, until I explored it in 1897 and 1898, and ascertained its identity with the stream called on its upper course "Frias" or "Tucutucos," by its Argentine discoverers, who had ventured various hypotheses as to its hydrographic relations; some of them believing it to be a southern branch of river Palena, while others imagined it to pass through lakes, that do not exist, to Aisen river. The question was further complicated by the discovery of Lake La Plata, from which the river Senguer originates, and to which an Argentine map published in 1897 gave such an extension to the west, that only a very short space of Cordillera was shown between the western extremity of the lake and the Pacific shores in Poyehuapi Inlet. I found, however, that the distance was twice that shown on the map, and that there were interposed between the coast and the lake, the deep depression containing the main valley of river Cisnes and the powerful Cordillera ranges bordering it on both sides.

The river Cisnes' lower course, as well as the ranges referred to, runs in an east-north-east direction for about 18 miles, and deviates then almost due east for some 12 miles, this part of the valley widening, in places occupied by well-wooded plains, where the *mañiu* and *ciprés* are abundant, while *alerce* and *cedro* are no longer found. I have surveyed carefully this part of the country from the summit of Cerro del Gallo (4200 feet) and Cordon de los Huemules (4500 feet), as well as from another hilltop at the south of the valley, and have made an accessory excursion to Lake Torres; all of which enables me to state that the whole country sighted on those occasions does not contain any meridional dominant or principal chain; on the contrary, short ranges and high, snow-clad, isolated groups prevail either at the north and to the south of the Cisnes valley, their trend being south-easterly, and at the same time interrupted by deep valleys and lakelet basins lying in the same

on. Among these valleys the largest is that containing the Lake Las Torres, into the waters of which plunge straight down precipitous slopes of the mountain to which we gave the same

At the back, that is to say to the east, of the latter, rise snow-capped Cordilleras, from 5300 to 5600 feet high, which have been fixed by a Chilean Boundary Commission in 1898-99 as the divide place, and their eastern sides sloping down into Lake La Plata. The longitudinal extent of those dividing mountains does not exceed, however, over 7 to 8 miles, as they come to an end towards the north, at the border of the Cisnes valley, which runs here decidedly to the east, while on the southern side another depression runs to the



RIVER BAKER IN ITS LOWER COURSE (LOOKING SOUTH-WEST).

east, from Lake Torres towards the Upper Mañuales valley, that is the northern head-waters of river Aisen.

The La Plata and Fontana lakes basin (the level of the waters about 3100 feet above the sea) is a vast and hollow depression of the Cordillera some 35 miles in length and in a general direction to the north-east. This basin is divided from the Cisnes and Mañuales valleys by unbroken cordilleran ranges, with summits rising above 10,000 feet, and containing glaciers as those from which spring the waters of river Mañuales.

The northern range extends eastwards, bearing the divide until its junction with apparently meridional parallel ranges that form the

upper Gato and Apulen valleys, tributaries to the Senguer, and, lowering gradually merge into the Senguer Pampa.

The southern range is stretched eastwards to the "Pico Katterfeld" (6135 feet), from whence another range extends for some 28 miles, formed of flat-top hills like "Cerro Guia" and "Cerro Kamkelshake," the slopes of the latter merging into the pampa, where the "Arroyo Verde" and "Rio Senguer" meet farther on.

The foregoing description shows how, to the south of the 44th parallel, the formation of extensive subandine valleys in a southerly direction disappears. The valleys of the river Cisnes' southern upper course, of some tributaries to the Apulen and Gato rivers stretching in that general direction, do not present an extension to be compared with that of the main Cisnes valley. A wide stretch of pampean ground comes from the east, encroaching into this valley to near the foot of Cerro Cáceres (5350 feet), which is the culminating point of the various ranges on the northern side of the depression. These grounds are doubtlessly especially favourable to cattle-raising; though there is no scarcity of land fit for culture, there is at present a great drawback in the shape of the numberless small rodents called "Tucutucos" (*Ctenomys*), that undermine the best soil, and are only made to disappear little by little as the settlers bring cattle or other domestic animals on to the ground; the good effect of this has already been proved in many sheep-pastures on the Magellanic territory.

As on other subandine valleys, the animal kingdom is here much better represented than in the dark forests of the coast region which, however picturesque they may be, are sadly in want of the animation that forms the particular attraction of primeval forests in other quarters of the globe. The so-called lions (*pumas*) hunt everywhere, but are great cowards, and are hardly to be seen; on the other hand, several species of foxes are a real nuisance, and extend their incursions to the very tents of the travellers. The animal that excites the greatest interest in these places is, however, the Huemul (*Cervus chilensis*) species of deer, whose habitat extends all over Andine Patagonia, exception being made of the thick woods and dense bamboo shrubberies of the Pacific coast; huemules are found in great number in the intermediate region of subandine valleys, as distant from the wet and impenetrable forests of the coast as from the barren Patagonian uplands. From the river Aisen southwards they begin to descend more near the seashore, as the forests are not so dense in the valleys; but everywhere the region of quilas and colihues (bamboos) has been passed, herds of deer are seen, even among the snow. The flesh of the huemules is an excellent food, and it is easy to hunt them. During the Cisnes expedition, as most of our provisions were rather spoiled on account of the excessive rains, we have been for whole weeks subsisting on such meat. When we go farther east, among the bare hills and undulating

round of the so-called Patagonian pampa, huemules alternate with guanacos, the real abode of the latter being the arid Patagonian plains.

A large space of the Andine region to the south of the 45th parallel is occupied by the fluvial basin of river Aisen and its two main branches, of about the same importance, the rivers Mañuales and Simpson, the union of which takes place at Flores island, some 18 miles from the sea-shore. Both of these rivers were explored by the two parties into which I divided my expedition during the summer season of 1896-97; the first one, under Mr. de Fischer, taking charge of Simpson river and its tributary, Coihaique river; the other coming up with me to the Mañuales headwaters, and crossing over the southern slopes of Lake Fontana's Cordillera to the region of the divide. This section of the divide has been, moreover, surveyed by boundary commissions of both countries in recent seasons.

The deep depression of the lower course of the Aisen river forms the eastward extension of the beautiful Aisen fjord or inlet, stretched some 35 miles inland, and at the bottom of which, near the river mouth, there is a well-sheltered though rather small harbour. Although the woods covering the lower alluvial valley contain the same kind of trees and shrubbery already spoken of when describing the northern valleys, we have observed that this country is not so thickly wooded, and landscapes of a park-like aspect are sighted, where the paths are cleared with relative ease. Everywhere traces are found of the labour of the Chilote woodmen, who frequently penetrate through these forests to obtain the valuable ciprés timber. The river banks are usually high and, consequently, protected against the winter floods, and have, with their quila shrubberies and deep layer of vegetable soil, all the conditions that could be required for settlements.

In the neighbourhood of Flores island the main depression of the Aisen valley, running east-south-east, is met by another coming from the north-east, watered by the stream called by us Mañuales on account of the large number of mañius in the forest; these coniferæ being so predominant and so close together in some places that not even the quila or colihue bushes are allowed to grow under their shade.

The Mañuales valley is a succession of wide and narrow places, the current of the river being extremely strong in the latter, lacking all kinds of beaches. High snowy ranges are seen at either side running in the same direction as the valley; their continuity being broken by important tributary valleys, as those of the river Emperor William and Ñirehuau, the depressions of these running from east to west throughout the central masses of the Cordillera. The river Ñirehuau, in the upper valley of which there are already some settlers who have come from the Argentine side, has its sources near the continental divide in all the

stretch from the 45th parallel down to $45^{\circ} 23'$ S. lat. From Pico Katterfeld the divide runs over a tableland about 4200 feet high by a tolerably well-defined ridge, sloping eastwards towards Arroyo Verde and a sink basin called Laguna Coyet, similar to many others found in the country south of the 45th parallel. The tableland slopes gently to the east and falls steeply to the west, and the relative level of the valleys at both sides of the divide does not depart from the general rule mentioned before. The settlement called "Casa Richards" in the Ñirehuan valley is only 1700 feet above sea-level, while the Coyet lagoon is 2650 feet, and the lowest points of the divide on the border of the tableland vary between 2800 and 3650 feet.

The examination of a map of the Patagonian west coast shows that between the 41st and $45^{\circ} 30'$ parallels it is interrupted at more or less regular distances by long inlets of the sea, and the extension of these into hollow depressions of the territory, resulting in a certain regularity of conformation, even in the crossing of the principal masses of the Cordillera. As far as the 46th parallel we find the deep valley of the river Huemules, though the upper branches do not reach as far as the divide. Farther south we are confronted, however, by a different orohydrographical disposition of the ground, owing to the Cordillera forming to a larger extent a more coherent mass, the breaches and depressions of which are obstructed by enormous snow-fields and glaciers, that constitute a kind of "Inland ice," some 80 miles long and 30 miles wide, and their western outflow giving origin to huge tongues of ice that descend down to the sea-level or very little above it.

In the course of my last expedition in November and December, 1898, I travelled all along the coast southward of the 46th parallel; I crossed the Isthmus of Ofqui, pulling my boats over its glacial ground from Lake San Rafael to river San Tadeo, and went on exploring farther south, penetrating into various large inlets of the Gulf of Penas, until I sailed on the several branches of Baker channel, the largest of all the beautiful inlets in the Patagonian coast. Save in the case of the latter, where several valleys and rivers that shall be spoken of later on are discharged, there is only one place free from the icy barrier interposed between the end of these inlets and the hinterland; we refer to the Exploradores bay, about $46^{\circ} 21'$ S. lat., and its inland extension in a river valley that appears to penetrate far into the Cordillera. The exploration of this section has yet to be made, before it can be ascertained beyond doubt that the uninterrupted meridional chain of snow-covered Cordillera drawn in all the actual maps of the region between Mount San Valentín and San Clemente summits, has a real existence.

The low land barrier thrown across the otherwise continuous series of sea channels running between Taitao peninsula and the mainland, is

evidently the result of the accumulated deposits of former more powerful glaciers, of which the remains are only now to be seen in the three ice rivers that come down to the sea-level; the first, unknown before, it appears, descends into a small bay of the eastern coast of Elefantes inlet; the second being the famous San Rafael glacier, the icy tongue of which projects into the middle of the lake of that name; and the third and largest, with two branches, from which flow respectively the eastern streams that form river San Tadeo. Nothing grander could be conceived than the sight enjoyed by the eyes of the explorer in these places; nothing more striking than the contrast offered by the blue-white colour of the icy streams protruding from



RIVER PASCUA AND LAGOON (LOOKING NORTH).

large openings of the Cordillera, with the sombre hue of the rocks and cracks of the latter, the ashy green of the lake, and the deep green frame of the surrounding forests. The ice blocks that become detached at every moment from the front of the San Rafael glacier, float on the lake, and are carried through its river outlet to the neighbouring estuary. One thing that cannot but be noticed when going over the lowlands lying at the actual foot of those glaciers, or within their primary extension, is the enormous number of dead trees, remains of whole forests, usually of ciprés trees, which have very likely been destroyed by the invasion of those lands by melted ice. This fact seems to point to a receding movement in the terminus of some of these glaciers, such as

has also been observed at other parts of the Cordillera, especially on its eastern borders, where, on account of the lesser activity of the erosive forces, the moraine lines and other traces of ancient glaciers have been better preserved.

The Gulf of Penas is one of the most dreaded places of the Patagonian seas; even in calm weather, which seldom occurs, a heavy swell from the south-west breaks unceasingly against the precipitous flanks of the mountainous and bleak coast, and sometimes even the inner recesses of the fjords are vainly searched for a safe harbour. The crossing of the Cordillera is here a very difficult, if not an impossible undertaking, as the Gulf of Penas inlets do not lead to the access of any river navigable for boats, and even a march on foot would be stopped by the icy barriers standing at a few miles from the ends of the sea inlets. Swampy and flooded ground covered by forests of dead ciprés trees, or by the fearful entanglements of tepú bushes which take here the place of the quilantos, form the bottom of the depressions. Farther inland, a disorderly multitude of black peaks show their rocky heads out of the ice and snow-fields of the Cordillera, calling to mind the Greenland "Nunataks." The compacted snow-fields that feed the glaciers are, doubtlessly, very extensive, and we are inclined to believe that they form a continuous mass at the back of the coast ranges, and cover the slopes of the gigantic San Valentin massive and other dependent mountains.

Near the 48th parallel, the southern extremity of the Gulf of Penas is confined between some groups of high and rocky islands, which mark the meeting-place of two systems of sea channels intersecting at right angles: the first having as principal axis the Messier channel, and being extended without interruption as far as the western entrance of the Straits of Magellan; the other formed by the Baker channel, otherwise called "Estero Calen," and composed of two parallel arms extending some 30 miles inland in an easterly direction, and branching out further on in three inlets lying to the north, east, and east-south-east, the furthest eastern extremity being at some 55 miles from the channel entrance. Not far from the latter, two secondary inlets spread out, one to the north-east, the other to the south-east, very nearly interlocking, the first one with Boca-Canales inlet, and the second with a large fjord system, lying to the south of Baker channel, and explored for the first time by the Argentine boundary commissions. In my last expedition I crossed the low isthmus, only a little over 1000 feet long, between both systems, and found there a clear path for the conveyance of boats, no doubt frequented by the natives that happen to haunt those places.

It may here be said that in all the Patagonian coast already described there are actually no Indians or native settlements; and it seems that Baker channel is the northernmost part where this not always harmless

people extend their incursions, hunting for seals, that swarm on the detached rocks of the coast, or looking for shell-fish, which is their staple food. In past centuries this coast was inhabited, as is shown by the narratives by Don Antonio de Vea, Sir John Byron, and Father Garcia, who writes on his map the name of "Nación Calen" as that of the native inhabitants of the littoral to the south of Baker channel. In the journal of the voyage of Don Antonio de Vea there is frequent mention of Caucahue Indians, whose abode must have been also here or in the neighbourhood of Wellington Archipelago. There is no doubt that these Indians were always making excursions to the inlets and rivers of the coast, where their dwellings were seen by the aforesaid travellers; and it is not uninteresting to know that mention is also made of large numbers of dogs sharing company with the natives, this being in favour of the opinion that the dog was an aboriginal in these parts of South America. It is only in the present century that the natives have retired to the last recesses of the less frequented channels and estuaries of the southern extremity, but Captain Fitzroy saw, however, some of their wigwams on the coast of the Boca-Canales. In the course of our expedition to Baker valley we found traces of ancient conflagrations and some worked stones, unmistakable signs, in my opinion, that the attractive Cordilleran valleys at the hinterland of Baker channel, relatively easy of access from the sea-shore, have been inhabited, or at least visited, by natives. In connection with these remarks a certain interest is attached to an indication contained in the celebrated official Spanish map drawn by Cano y Olmedilla, where, at the place where the river Baker, or Las Heras, actually flows, a stream, called "Rio de los Caucahues Bravos," is traced as draining a lake labelled "Chelenco," perhaps the first information about Lake Buenos Aires.

As a result of explorations and surveys carried out either by Chile or by the Argentine Republic in the two last seasons, it has been ascertained that Lake Buenos Aires from the north, as well as Lake San Martin from the south, are drained through fluvial and lacustrine systems, more or less complex, towards Baker channel, so that this splendid fjord receives through the not very distant mouths of two rivers the largest part of the waters that fall on the vast Andine region between parallels 46° and 49° 20'—that is to say, more than three degrees of the meridian.

When I was going to start from Santiago de Chile in November, 1898, with the purpose of exploring the hydrographical basin drained to Baker channel, I had at hand no other positive information about that region than a short narrative and hydrographic chart showing the results of the first exploration and survey of Baker channel by Captain Rodriguez of the Chilean Navy effected in 1888. It was known, besides, that an Argentine commission had explored the upper course of the river draining Lake Buenos Aires, which they called

Rio Las Heras, and was supposed to be the same which another commission had reconnoitered in its lower course as emptying into Baker channel. The same supposition was also made respecting the drainage of another large lake discovered as well, simultaneously, by a Chilean and an Argentine commission in $47^{\circ} 20'$ S. lat., and called Cochrane by the former and Pueyrredon by the latter. An American naturalist, Mr. Hatcher, had also discovered, in 1897 (about $48^{\circ} 30'$ S. lat.), a large river running to the west, named by him River Mayer; and finally there was reliable information as to the Lake San Martín, hitherto shown on all maps as a tributary to the Santa Cruz basin, being also drained down to a fjord on the Pacific coast. I have deemed it necessary to make this explanation, so as to leave well-established the independence of the discoveries made by me and my fellow-travellers, Señor Michell, Count Schulenburg, and Mr. Hambleton, during our journey in 1898-99.

After a detailed survey of the several inlets and branches of Baker channel, I resolved to penetrate to the interior of the Cordillera by the valley of the largest river, the mouth of which we had found on the north-eastern coast, between the entrance of the northern and eastern inlets. This river, called by us Baker, which has been found to be the same named Las Heras in its upper course by the Argentine explorers, is doubtlessly the largest river in all Patagonia, as it should be, since it drains the largest of Patagonian lakes, Lake Buenos Aires, as well as Lake Cochrane, and receives the melting waters of numerous and extensive snowfields and glaciers of the Cordilleran ranges that lie at either side of its valley. We navigated this river with the boats for 43 miles, until we reached the foot of a fall, where the river, that down-stream is as much as a third of a mile wide, comes here rushing in a body between rock-walls some 60 feet apart from a height of 35 feet. Further up-stream the rapids do not allow the navigation for a stretch, after which it could be resumed for a very considerable distance, as the river widens again and comes down meandering through a large valley between forests and swampy plains.

The general direction of the valley and its bordering ranges is to the north-east for some 25 miles, and to the north-north-east for some 50 more, where it comes from the great depression of the south-western arm of Lake Buenos Aires. From the western side Baker river has, among other tributaries, the one which is called by us "Rio Ventisqueros," which runs from north-west through a large opening in the mountains bearing the glaciers which bar the way from the coast. By the eastern side it is joined by four large tributaries: two of them, rivers Ñadi and Salto, proceeding from the south-east through spacious valleys with tributary lakes branching up to the base of Mount Cochrane (Mount San Lorenzo of the Argentine maps), which rises 12,140 feet above sea level. This powerful massive competes with Mounts San Valentín and

San Clemente as to which is the highest of Patagonia, and surpasses, with its white summit outflanked by dark, abrupt battlements, a whole group of little-known Cordilleran masses. At the foot of its eastern and south-eastern slopes several lakes lie that send in a southerly direction their drainage-channels as a tributary to the river Mayer, showing a marked analogy with the upper Futaleufú region as to its orohydrographical conformation, though the ground shows a difference as to the greater abundance of grass-covered land and lesser density of the forests. The valley is bordered to the east by a well-defined range, by the summits of which (more than 6500 feet high) the continental divide is effected in an extent of some 52 miles, shedding to the east the waters that form the rivers Belgrano and Lista, branches of Rio Chico flowing to the Atlantic.

A new feature in land-forms which appears to the south of the 46th parallel are high and extensive tablelands of neo-plutonic formation, emerging, so to say, from the buttresses of the Cordillera and unrolling eastwards into bleak desolate uplands with neither grass nor water, and only broken at long distances by "cañadones," more or less spacious valleys, sometimes dry and sometimes watered by streams of usually small importance. As a type of these tablelands, the one extending to the south of Lake Buenos Aires' eastern part may be mentioned; its width on either direction exceeds 35 miles, and its average altitude is not much under 5000 feet above the sea. Towards its western border there is a swelling of the plain that culminates in a group of snow-clad mountains, their summit, Mount Zeballos, rising above 9000 feet over the sea.

On the northern and southern sides of this high plateau are two profound depressions extending far to the west, and in their bottom lie respectively the Lakes Buenos Aires and Cochrane, the latter being drained by a copious, but short stream to the river Baker, which comes from the former. Both depressions are extended eastwards into the valleys of the river Deseado and river Jillo respectively, only the first of these being able to carry its waters through to the Atlantic. The divide at the highest points of both depressions only rises to 1640 feet and 1960 feet above the sea-level, these being the lowest stretches of the water-parting line in the austral region we are dealing with at present; while between both points this line crosses over the high tablelands before mentioned at a height above 5000 feet. Southwards of the Jillo depression the divide rises again up to 5250 feet, over a second rugged tableland furrowed eastwards by the headwaters of river Olni, a small, incomplete stream that sinks into salt marshes some way down the Pampa. This waste plateau is sometimes covered by snow already as early as from the end of the summer season. It is swelled westwards into a Cordilleran range culminating in Mount Belgrano (7870 feet), a point of the divide; this line runs from there halfway to Mount Cochrane,

where it meets the ridge confining the headwaters basin of river Mayer, and turns abruptly to the south, coming down again to about 3300 feet at a point separating the remotest sources of rivers Chico and Mayer.

The valley of the river Mayer's upper course appears to be one of the most valuable in Patagonia. The whole basin of this river, as well as Lake San Martin are, according to the last reports, drained to Baker channel. In our reconnoitering expedition to the south-eastern arm of this fjord we found at its eastern extremity a rather big river, the lower course of which runs among extensive alluvial deposits, where it is joined by another river originated by a neighbouring glacier. At the same time we found an inscription left a year before by an Argentine Commission, where their belief was stated, that this river came from a lake lying to the north-east. I ascertained, however, after a four days' excursion headwards into the valley, that, although the lake exists in the alleged situation, the main river proceeds from a narrow stretch of the valley extending southwards in an opening between snow-clad ranges. I formed then the opinion that this large river, called "De la Pascua" by us (river Toro by the Argentine party), the volume of which was an indication that it came from the divide, should be the lower course of the river Mayer. The upper course of the latter is, in fact, stated by its discoverer Mr. Hatcher to lie by $48^{\circ} 30' S.$ lat., that is to say, in the region from which the river Pascua apparently proceeds.* My supposition has been completed, I have recently seen, by the Argentine geographers, by the ulterior information that the river Mayer flows into Lake San Martin, the latter being drained to Baker channel by the river Pascua.

To conclude, I must call attention to the blanks that must still be filled to complete our knowledge of the Patagonian Cordillera between the 41st and 48th parallels.

In the first place, topographical surveys are lacking of these sections interposed between Cochamó and Puelo lower courses; between the latter and Lower Yelcho; the Claro hydrographic basin up to its supposed upper course, river Pico; and, finally, a long stretch of Cordillera between the Aisen lower course down to Baker channel's northern inlet.

In the second place, we are far from possessing a scientific know—

* Recently I received the news that my fellow-traveller, Mr. Michell, from the Chilean Boundary Commission, resolved conclusively the hydrographical problem of river Pascua during his expedition carried out in the summer season of 1899 to 1900. Going up in the Pascua valley from the sea-shore for about 50 miles, he reached the origin of the river in a branch of Lake San Martin, the outlet of which lies in the neighbourhood of Mount Chaltén.

ledge of this Cordillera, based on a minute examination of its intimate forms and its tectonic structural lines. We have as yet but detached pieces, so to say, of a geological mosaic work, gathered in the course of a few journeys through the Andine masses, all of which is barely sufficient to enable us to draw two or three sections or profiles at different latitudes. A good deal of information has been collected about the glacial phenomena which have taken place in former periods in those localities, and permits us to determine with a certain amount of accuracy the areas covered by such phenomena, and to form some idea as to their effect on land-sculpture. Still, this information is not enough, in my opinion, to allow the geological history of the Southern Andes to be attempted, or to settle, as has been rightly observed by one of the Argentine explorers,* the chronological order of the formation of the valleys, the genesis of the lakes, their partial desiccation, the capture of streams, the basaltic eruptions and the glacial phenomena. The expeditions which explore an unknown region have to attend first to the topographical surveys, and have seldom the opportunity to stay long enough at one place so as to give a proper time to the study of the physiography and geology of its surroundings. The difficulties imposed by the dense vegetation and the ruggedness of the rocks continuously worn out by weathering and erosion to the examination of the petrographical and stratigraphical features must be taken into account; as well as the inconvenience of the unavoidable and worrying method of transportation by carriers, that only allows the explorer to collect a very limited amount of specimens for ulterior study.

It cannot, then, be expected that these first pioneer expeditions should contribute except on a restricted scale to the knowledge of all the branches of natural history relative to the Patagonian Cordillera. But an improvement on the actual conditions will not be delayed for long. The clearing of paths and opening of roads, which are being actively pursued on the Chilean side, as well as the increasing number of settlers coming from the Argentine side to the subandine valleys, promise to scientific travellers the support and resources that they need for reaching the innermost recesses of the mountains, and so help to raise little by little the veil that still hangs over large tracts of this vast country.

Before the reading of the paper, the President made the following remarks: This evening we have to welcome here Dr. Steffen, who has been during the last ten years engaged in exploring the Patagonian Andes. He considers himself merely pioneer, but when you have heard his paper, I think you will all come to the conclusion that he is a very thorough and good pioneer.

After the reading of the paper, the following discussion took place:—

* See 'Revista del Museo de la Plata,' vol. ix. p. 249.

Prof. BERTRAND (Santiago University) said that, although he knew only a little outside, so to say, of the intricate region into which Dr. Steffen had penetrated several times, he might perhaps offer a few remarks intended to resume the general conditions of the country, as well as to point out some important questions that arise with respect to the causes by which its land-forms have been produced. The first general fact that may be deduced from the account of the explorers, with regard to the conditions of travel, is that, though the country extends chiefly from north to south, the customary changes in climate correlative with the latitude are hardly perceptible, while those from east to west are most striking. For this, of course, the groups and chains of the Cordillera are mainly responsible, as the more westerly ranges act as a screen where nearly all the moisture and snow carried by the prevailing westerly winds are detained. The climate is also deeply influenced, undoubtedly, by the cold waters of the sea coming from the polar ocean, drawn northwards by the current noticeable along the Chilean coast. Turning to the aspect of the ground, we have heard to-night that on the littoral and amongst the western ranges of Cordilleras the rugged character of the country, due as well to the uplift of mountains as to the erosion of valleys, is most impressive, the dense forests contributing to increase the difficulties of travel, so that this can only be effected on foot. Further eastward, however, towards the region mentioned as *subandine*, the mountain slopes become less steep, the forest less dense, and the climate milder, as the winds, rains, and snowfalls, broken and spilt on the westerly ranges, are less and less frequent and severe. Among the questions that refer to the morphology of the land, the orography comes first. Though an attempt has been made to show in a sketch-map the extent and trend of such ranges of the Cordilleras as have been located by surveyors on the side of Chile, and more might be added from other sources, there is still a great amount of surveying and levelling to be done before sufficient material is collected to draw a contoured map that could be shown as a fair representation of the ground. Then come the geological questions: the petrographical constitution of the various mountains, the origin of the glacial and alluvial deposits, the relative ages of the actual parts, and the geological connections between them and those of the northern Cordillera. Finally, the very interesting question of land-sculpture may be mentioned. The conformity or non-conformity of actual river-valleys with former tectonic valleys has to be ascertained. It may be asked if the more important of these valleys are pre-existent to the powerful Cordilleran masses through which their course actually lie; how far has the erosion worked in a receding sense, and to what extent has the capture of streams at the headwaters of great rivers altered the primitive drainage areas. Explorations like those undertaken by Dr. Steffen are the first steps towards the answers to such queries. They form the best foundation for ulterior and detailed surveys such as those that both countries interested in the boundary are now carrying out, and the result of which will be at least a valuable contribution to the morphology of Patagonia.

After some remarks from Colonel Church, the PRESIDENT said: When I had the honour of addressing this Society for the first time as President, I alluded to the vast extent of unexplored country in different parts of the world, and particularly mentioned these Patagonian Andes. At that very time the exploration which I wished for was commencing both on the Chilean and on the Argentine sides. Our old friend, Sir Woodbine Parrish, for so many years a member of the Council, communicated to us the interesting journal of Villarino, the old Spanish pilot of the Rio Negro, and eight years after we received a most interesting paper by Don Guillermo Cox, also communicated by Sir Woodbine Parrish, who was our referee for many years on all subjects connected with South America. Sir

Woodbine's successor in our present Council is Colonel Church, and most ably he fills that post. This evening he has nearly singed his wings on the burning question of arbitration. There can be no doubt whatever that when two countries do differ—although we are not allowed to refer to a political question here—on questions of boundary, it is an immense gain to geography. Atlases of the deepest interest and many volumes have been published in consequence of the arbitration between Venezuela and British Guiana, and we have no doubt a similar wealth of information will be derived from the arbitration between Chile and Argentina. Last year we listened to a most valuable paper, which was communicated to us by Dr. Moreno, from which we received much new information respecting the eastern slopes of the Patagonian Cordillera; and this evening I am quite sure you will pass a unanimous vote of thanks to Dr. Steffen, for having given us such an admirable description of the valley of the Puelo and the Baker or Las Heras river, taking up only two parts of the work of exploration with which he has been engaged; for I gather, from the beautiful slides which he has shown us of the scenery of that coast, that he has also explored the other rivers between the Puelo and the Gulf of Penas. I am sure you will all wish me to tell Dr. Steffen that you have passed a unanimous vote of thanks to him.

ANCIENT TRADING CENTRES OF THE PERSIAN GULF.

By Captain ARTHUR W. STIFFE, R.I.M.

VI. BANDAR 'ABBAS.

SOME interest attaches to this place, as the first commercial settlement of the English in the Persian gulf, who established themselves here after the fall of Hormúz in 1622. It is still the principal port of Karmán and Lar, and its trade is much increased since it has been a port of call for the Gulf mail steamers. The anchorage is commodious and safe, and of convenient depth and good holding ground. It is protected from heavy sea by the islands of Hormúz, Larek, and Kesm (or at-Tawilah). Above thirty large transports and steamers were lying here in November, 1856, it being the rendezvous for the expedition which in that year captured Bushire. There is good anchorage for any number of ships off the place. The water is shoal off the town, 3 fathoms' water being about a mile off shore, and 4 fathoms about twice that distance. It would be very easy to build a long pier to land at, but all the work is done in boats, and except at high water landing is unpleasant, as you have to be carried some distance. It is often called only "Bandar."

It stands on the Persian coast in lat. $27^{\circ} 10' 29''$, is fortified on the land side with a wall and round bastions, at the time of our visits very dilapidated, and contained then about 10,000 to 12,000 inhabitants, who mostly migrated during the hot weather. The land near is a great plain extending towards the foot of the great mountains 16 miles off in a northerly direction, which rise to a height of near 8000 feet. It is mostly uncultivated. The town has a frontage to the sea of near three-quarters of a mile, the only building of any pretension being the old Dutch factory, which is a large quadrangle, and fortified with a wall and towers. It was in fair repair, and used as the residence of the Chief. There are no date plantations near the town. The ruins of the British factory were pointed out some distance to the westward of the town, but little of it remains except the foundations. In the plain, about a quarter of a mile northward of the town, stands a group of tombs of the

European merchants (see sketch). These have been large and pretentious erections, after the fashion of those days, such as may be seen at Surat, etc. They are fast crumbling to ruin; the largest was about 30 feet high, many were mere mounds. No inscriptions could be found.* The place would become, under a civilized government, a place of considerable commercial importance, as it is advantageously situated for communication with the interior, and the whole eastern part of Persia. We were informed the caravans take twenty days from here to Karmán, and thirteen to Lar. The Governor is also ruler of the country adjacent. The



MAUSOLIA NEAR BANDAR 'ABBAS—THE HIGHEST ABOUT 30 FEET HIGH.

celebrated carpets of Karmán are exported from this place, also much sulphur from the mines at Khamír, which are worked in a rude, wasteful manner.

HISTORY.

It appears to have been at first merely a small fort erected by the Portuguese to protect their water-supply for Hormúz. It is called by Faria y Souza Comoran,† whence probably the old English name of Gombroon. Sir Thomas Herbert visited the place in 1627,‡ and gives the date of its erection as 1513. Captain Hamilton ('New Account,' etc.) says, "Gombroon had its appellation from the Portuguese in derision, because it was a good place for catching prawns or shrimps, which they call Camarong." Faria y Souza§ says it was taken from the Portuguese in 1614 by a Persian force of 14,000 men under the "captain" of Shiráz, after an ineffectual attempt in the previous year. It was only after its capture by the Persians that it received the name of Bandar Abbas, after the great king of Persia, who ousted the Portuguese from this place and Hormúz.

Pietro della Valle|| arrived "at 'Combru,' called Port Abbassim since King Abbas took it from the Portuguese," in September, 1622. He says the streets and even the bazaar are narrow and small, and shops badly supplied. Without counting those left in Ormuz fort (which place had just been taken), there were here seventy or eighty pieces of ordnance, of which some had been given to the English; some

* These tombs, visited by J. B. Fraser in 1821, are described by him as then much in the same state as at present ('Narration of a Journey into Khorassan,' etc.).

† 'The Portuguese Asia.' Translated by Captain John Stevens. London, 1695.

‡ 'Some Years' Travels into Africa and Asia the Great.' London, 1677.

§ *Ante.*

|| 'Travels of. into East India,' etc. London, 1665.

were large, nearly all made in the last five or six years, and marked with the arms and name of the King of Spain, weights of gun and shot, and charge of powder. On some were the names of the Viceroys. The fort, which he was not able to enter, was not that built by the Portuguese on the shore, but a new one, further inland, square, walls double but poor, no angles or outer defences except the inner wall, which had little round flanking towers, crenellated on top; the guns were mounted in a row, facing seawards, outside the gate. Our author next visited Hormúz in January, 1623.

In 1638, John Albert de Mandelsloe * arrived at Gombroon from Lar, very ill. He says, "it is not many years since it was a village, but since the reduction of Ormuz, the English, Dutch, and Indian ships have found out the convenience of the harbour and trade. . . . The entrance of the haven is defended by two strong castles and a square redoubt, with some artillery. The houses are of burnt brick, with good mortar. The Sultan's palace and the warehouses where the English and Dutch are lodged are the houses of state." He refers to the great heat, and says, "there is no grass or plants except what is produced in some gardens with incredible labour. It is chiefly provided from Kischmisch (Kesm). The chief time for trading was from October to May, when the caravans arrive. The English pay no duties, but ought to get half the customs, but are forced to be content with about a tenth part. No Portuguese were allowed to come to Gombroon, which is the occasion they live in open hostility with the Persians, take their ships," etc.

John Nieuhoff † went from Vingorla to 'Gamron' in 1662. He describes it between two castles, and defended on the sea side by three stone bastions, on which are mounted good store of iron cannon; on the land side was only a stone wall much decayed. The houses had wind-towers, and were of sun-dried brick whitened outside with lime. There was scarcity of water, and he mentions good Persian wines. He also mentions the great heat, owing to mountains at the back, and says it was only habitable for Europeans from December to March. Once a year caravans trade to Schiraz et. Posts were very expeditious between Gamroon and Ispahan.

John Struys ‡ went from Lar to Gamron in March, 1672, "called Bender," and describes it with two castles, built after the old manner, a reasonable strong wall towards the country, and without, has, at a convenient distance, several redoubts, also one on the coast. It has become a famous emporium frequented by Moors, English, French, and Hollanders. He speaks of the unhealthiness and great heat, "which is almost past after October."

Tavernier, § in 1665, travelled from Shiraz *via* Lar to Bandar Abbassi, but does not say much except that the town was built with the ruins of Hormúz, and that "while the Portuguese kept Ormus, though they lived in the city, all the trade was at Bandar Abbassi, as being the most secure landing-place on all the coast."

Chardin || visited Bandar Abbassi in 1674 and 1675; describes it as surrounded by walls on the land side, with two little forts, and 1400 or 1500 houses. The strand (quai), or sea-front, is more than a mile long. The houses of the French, English, and Hollander companies are the most commodious. The Governor's palace is in the part most distant from the sea, and built with stones and marble from Ormus. He mentions the wind-towers on the flat roofs, says it is only a

* Harris' Collection, 1744.

† Churchill's Collection, vol. ii. 1704.

‡ Voyages and travels of —, London, 1684.

§ Collection of travels of Tavernier . . . and other great men. London, 1684.

|| Voyages de Chev. Chardin en Perse. 1735.

roadstead, and ships load quickly by boats (as they do at the present day), he says, of coccanut wood (?) sewn together without any iron. He mentions the bad water and the large banyan tree, which attracted the attention and wonder of most travellers. It is still conspicuous, and stands some 3 miles east of the town, at a small village called Naband. He mentions that the English claim half the customs here, as the Portuguese the half at Congue. In 1675 news came to Ispahan from Congue that a Portuguese squadron had seized three native vessels with pilgrims to obtain their arrears of customs. They got tribute from even the smallest boats, and permitted no trade with India except in their own ships. They gave passports to ships under very stringent conditions and limitations.

Thevenot,* who went from Lar to Bender (-Abbassi) in 1684, says, it scarcely deserves the name of a good village. Half of the customs belong to the English, "but they receive not the fourth part, the Persians giving them but as little as they can." There is only "one public gate, a bazaar, and a small fort on the seaside, which chiefly consists in a square platform of about 4 fathoms each face, and some 2 fathoms high, with portholes for five or six pieces of cannon, but they have no more but two. The English and Dutch have each of them their houses, very well built by the seaside."

He did not proceed to India, as the Dutch could not take him, and there was danger from pirates.

Commodore Roggewein,† who sailed round the world in 1721-3, also refers to the multitude of pirates in those seas, mostly Europeans. He mentions the Dutch factory at Gombroon or Bender-abbassi, on the coast of Persia, where the director has an opportunity of making a vast fortune in a short time. The Dutch have by far the best factory, and have fortified it effectually. He also mentions an attack in 1701 by the Ballooches, with four thousand men, who were beaten off.

From Mr. F. C. Danvers'‡ report, I gather the following particulars regarding the English factory. There was some beginning of trade there shortly after the fall of Hormuz, and the agents agreed in 1631 to take from the king silk to the value of about £60,000 per annum, to be paid for one-third in money and two-thirds in goods. The rivalry of the Dutch seems to have been much felt, and the civil war in England also depressed the trade. In 1645 the company's property at Gombroon was all shipped to Basra for safety, so precarious was their position. Then follow intrigues, war with the Dutch, and negotiations, and fluctuations of trade of no great interest. In 1726, owing to the Afghan conquest of Persia, trade greatly declined. The factory at Bandar Abbas was under the Ispahan agency until 1750, when the latter was finally closed and the English retired to Gombroon. The end was not far off. In 1756 advice was received at Gombroon of war having been declared against France. On October 12, 1759, a French squadron of four vessels (one of seventy-four guns), under Comte d'Estaing, entered the roads of Gombroon, and on the following day they landed to the westward of the factory with two mortars and four pieces of cannon, and commenced an attack on the place, in which the vessels joined. The factory was in no position to defend itself against such odds, so the chief and council agreed to a capitulation, under which the factory and all its contents, including a large sum of money, were to be handed over to the French. The agency retired to the Dutch factory. The French, before withdrawing to their ships, set fire to the factory, in which they had placed explosives to ensure its complete destruction. They also burnt the company's ship *Speedwell*.

* 'The travels of M. de — into the Levant.' Newly done out of French. London, 1687.

† Kerr's collection, vol. ii.

‡ 'Report on the India Office Records relating to Persia,' etc.

After the retirement of the French, the people of the country completed the destruction of the factory.

A temporary establishment was kept on until 1763, when the agency was removed to Bushire, owing to the unsettled state of the country. In 1770 the agency was temporarily re-established, under orders from the Court of Directors, but was soon abandoned.

The Maskat Arabs occupied the place for near one hundred years, but were dispossessed by the Persians in 1854, after a siege. They appear to have paid some tribute to Persia, in acknowledgment of her over-lordship.

DR. JOVAN CVIJIC'S RESEARCHES IN MACEDONIA AND SOUTHERN ALBANIA.*

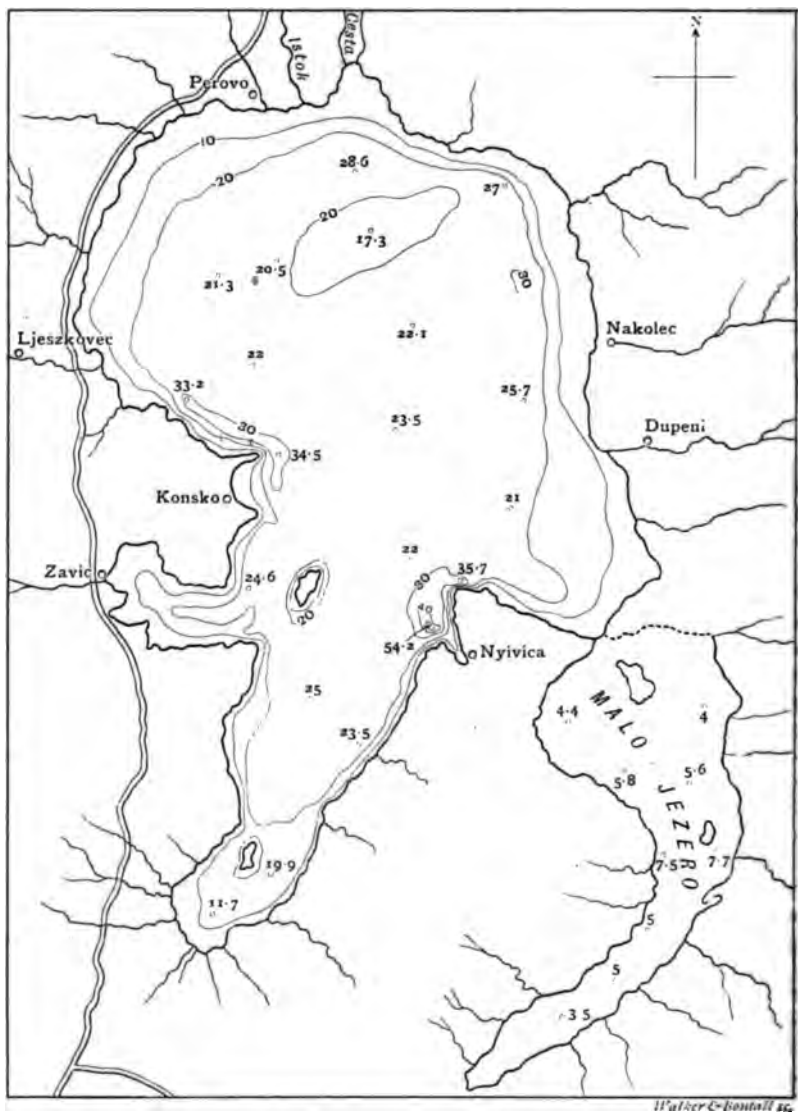
PRELIMINARY communication made by Dr. Cvijic to the Proceedings of the Serbian Geographical Society enables us to supplement the short account of the Professor's work in the Balkan peninsula which appeared in the April number of the *Journal* (vol. xv. p. 417).

Prof. Cvijic made his first journey in Macedonia without the advantage of a special recommendation on the part of the Sublime Porte, and on that account was always free to carry out his scientific labours at will. Travelling the next year with an open order to the Valis of Salonica and Monastir, supplied by the Ministry of the Interior, he met with nothing but courtesy from the authorities, often received with the oriental politeness shown to one recommended as a friend ("dost") by the higher powers. This dignified courtesy and the open character of the Turks permit a traveller with such credentials and possessed of any degree of tact to pass through Turkey without any unpleasant experiences so far as the Turks themselves are concerned. The Arnauts of Northern Albania—small clans known by the general designation of "Gheg"—are, on the contrary, quick to anger and suspicious. They must be treated with deference and bound by the well-known "Bessa"—their pledged word—which forms, in fact, in connection with the vendetta, the sole guarantee of public security. With this aid, however, travel is possible even in Northern Albania. The southern Arnauts, known as the Torkas, are totally different in character. They have been to some extent civilized by Greek influence, and have retained the chivalrous qualities of a race of mountaineers while apparently losing the less estimable traits. At all events, Dr. Cvijic draws a picture of their hospitable manners, which presents them in a most amiable light. The Slavs of Macedonia, who consider themselves as either Serbs or Bulgarians, were found by the traveller to be very distinct in character from the other Slavs of the Balkan peninsula. Their national feeling is less strongly developed than is the case with the rest of the southern branch of the race; they are industrious and frugal—even grasping. Yet there are marked exceptions which seem to prove that these qualities are not natural to them, but have been acquired under the stress of circumstances. The traveller needs to show prudence and determination in his dealings with them.

The Macedonian towns possess an old form of civilization, which presents few attractions to Europeans; still cleanliness is not a rarity, especially among the Christians. The monasteries, however, abound in dirt, and likewise the villages, so that, when spending the night at them, Dr. Cvijic was usually compelled to

* Communicated by Dr. K. Peucker, of Vienna.

bivouac in the open. Macedonia is poor, and may rank with Southern Greece as the poorest land in the Balkan peninsula. Of small fertility, extensively disforested, and without particularly good pasture land, the country cannot support

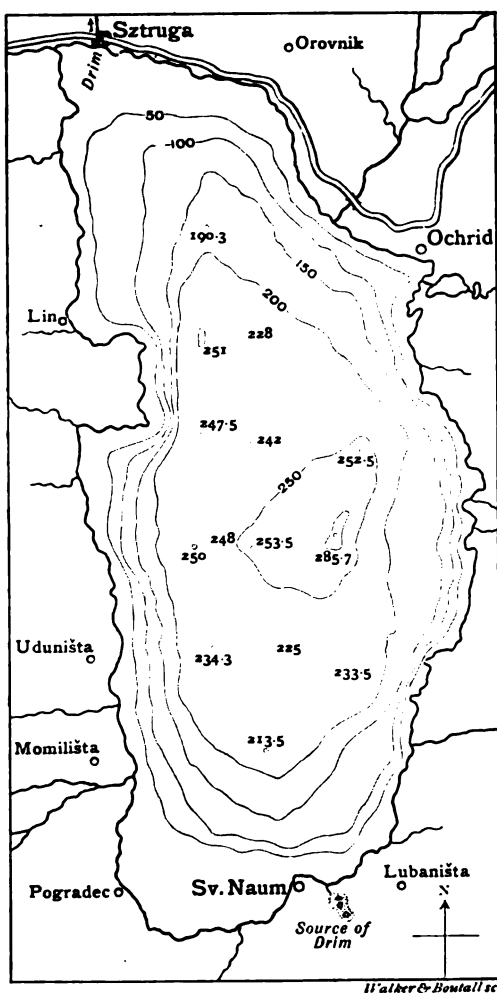


LAKE PRESPA, 1: 250,000.

its relatively numerous population, and therefore an important branch of occupation with the Macedonians is the taking service in foreign countries—"Pečalba," as it is called. Many thus become well-to-do and civilized.

The necessity of carrying with him even the supply of food for the journey

the scientific traveller's impedimenta—bulky enough under ordinary circumstances—more than usually cumbersome in these countries, European though. An escort is needed of one or two unmounted (Zaptiyes) or mounted men (Suvariyes), and a cavass or armed attendant, generally an Arnaut, to whom the traveller would be put down as a "fukara" (one of the rabble)



LAKE OCHRID, 1: 250,000.

his recent journey Prof. Cvijić had with him one of his pupils and a personal attendant, so that his party consisted in all of eight to ten persons, who were accompanied by five or six horses.

In 1898, Prof. Cvijić had explored, first the neighbourhood of Salonica, afterwards the basins of Serres and Dojran. He found the mountains of this region (Bešik, or Kušnica, Menikejske gore, Bozdag, Kruš, and Belašica) to consist either

of granite and the older crystalline schists, or of phyllites and crystalline limestone. They are block-systems, formed by recent fractures, while between them lie areas of depression—the basins of Macedonia. That of Serres contains three large lakes, in their present condition of recent age. Two of them, Tachinos and Butkovo, are swamps and peat-bogs with a maximum depth of only 6 to 7 feet, whereas the Dojran lake reaches depths of 20 metres (65 feet). Several mountains were ascended in Western Macedonia, including the Peristeri, on which the discovery was made of three “Kahre,” two small glacial lakes (at elevations of 7220 and 7280 feet respectively), and four small moraine-banks, which descend to a level of 6200 feet (1890 metres). These are the most southerly traces of former glaciation hitherto discovered in the Balkan peninsula. The lakes of Ochrid and Prespa, lying at altitudes of 2260 feet (690 metres) and 2790 feet (850 metres) respectively, occupy areas of depression, bounded by meridional lines of fracture. A rift follows the eastern side of Ochrid, and its northern continuation is marked by a series of conical hills with solfataras and recent volcanic rocks. The basin of Prespa with its two lakes lies on the boundary between the recent folded mountains in the west and the ancient masses in the east. Its marginal fractures are recognizable even in the tectonic structure of the lake floor (compare map).

In the summer of 1899, Dr. Cvijić began by examining Lake Amatovo, in the lower Vardar valley. Lying in a hollow of Pliocene sand and detritus, it constitutes a valley-lake without outlet, formed by an overflow from the Dojran lake. The dry river-channel is still distinguishable as far as the Vardar. Proceeding up the valley of the latter stream, Dr. Cvijić diverged to the south-west near Köprülü (Veles), and visited the antimonite mines of Rožden in the otherwise uninhabited mountain-range of Nuže-Kužuf. This range is formed by an ancient system of folds, traversed by newer fractures, which are marked by the abundance of trachytes and trachyte-tufas. Thence he made his way to the basin of Meglen, the garden of Macedonia, where, with a proper succession of sowings, three harvests ripen in the year. In this neighbourhood he visited Vodena, with its travertine waterfalls and deposits of calcareous tufa which have not their equal in Europe, and passed along the ancient *déversoir* of a diluvial lake, here followed by the Salonica-Monastir railway, to the largest remnant of the same, the lake of Ostrovo, which occupies the lowest depression of the basin of Saridjol (the Yellow lake). During the glacial period the whole basin was still occupied by this Yellow lake, the gradual desiccation of which can be traced with great clearness in a system of terraces and shore-lines. Other remnants of the old lake are seen in three smaller pieces of water. The present outflow of Ostrovo is subterranean.

From Ostrovo Dr. Cvijić proceeded by Monastir to Ochrid, of which a detailed survey by soundings was made. Depths over 200 metres (656 feet) occupy much more than a third of the area of the lake-floor, which thus has the form of a steep-sided trough. The temperature of the water at the greatest depth was 5.5° C. (42° Fahr.), and at the surface, in August, 21.4° C. (70½° Fahr.), the maximum gradient occurring between 30 and 35 metres (100 and 115 feet). The lake is further marked by a strong development of the phenomenon of the “Seiche,” or occasional variation in level of the surface (due to strong winds), such as was first proved to exist on the lake of Geneva by Prof. Forel. Small depressions occur in places on the lake-floor, resembling the Boubioz of the Lake of Annecy, the existence of which was determined by Delebecque. The lake derives the greater part of its transparent water from springs, which occur in holes and clefts along the southern limestone coast. The most copious is that known as the Drim source, south-east of the monastery of Saint Naum; but those which rise from rifts to the south-west of that monastery, over a hundred in number, supply together fifteen to twenty

times more water than the first-named spring. Others again occur beneath the water of the lake. All are subterranean outflows from the Lake of Prespa, a fact which Dr. Cvijić was able to prove by a thorough examination of the Karst region between the two lakes.

The basin of Lake Prespa contains two lakes, Prespa and the Malo-Jezero (the little lake), which, on existing maps, is wrongly designated as Ventrok or Drenovo. Ventrok (not Ventrok) is merely the name of the subterranean outlet from the south-west end of the Malo-Jezero to the Devol. That lake lies at the present day at a level of 16 to 20 feet higher than Lake Prespa, into which it discharges directly. During the glacial epoch it still formed a deep bay of the larger lake. The latter receives its most numerous tributaries from the Peristeri range in the north-east, but principally from the north. It discharges its waters subterraneously to Lake Ochrida (and thus to the Drim), and also to the Devol. Hydrographically, therefore, the lake is a basin of bifurcation. The floor of the lake is broken near the margin by two channels, the result of structural disturbances (cf. map), that in the west having a maximum depth of 34·5 metres (113 feet), that on the east one of 54 metres (177 feet). The greater part of the basin consists of nearly level ground, with a depth below water-level of little more than 20 metres (60-70 feet). Both Ochrida and Prespa are old lakes, which since younger Tertiary times have been subject to fluctuations of level, evidences of which can be traced with precision along the shore-line at the present day.

After sounding the small lake of Kastoria, south-east of the Prespa basin, Dr. Cvijić concluded his last year's journey in Macedonia with an excursion into the Nice range. As a result of his researches, the most important limnological problem which awaited solution on European ground may be regarded as cleared up in its broad outlines.

The following table gives some of the limnometric values communicated by the author or obtained provisionally from the material now available:—

	Height above sea in feet.	No. of soundings.	Area. Sq. miles.	Maximum depth, Feet.	Mean depth. Feet.
Amatovo	—	—	circ. 6·6	circ. 8	—
Dojran	530	—	—	circ. 66	—
Ostrovo	1730	—	circ. 30	200	—
Malo Jezero	2810	circ. 80	21	25	circ. 13
Prespa	2790	circ. 250	115	177	circ. 60
Ochrid	2260	circ. 190	107	938	circ. 480

Ochrid, with its area of 277 * square kilometres (107 square miles), contains over seven times more water than Prespa, which, with an area of 298 square kilometres (115 square miles), is 8 per cent. larger; and probably not much less than the Lake of Constance, though only half the size of the latter.

NOTE.—The accompanying sketch-maps are based on the maps given in the *Mitteilungen* of the Royal Hungarian Geographical Society, with additions from the original drawings kindly placed at the disposal of the writer of the present article by the author.

* Obtained by measurement with the planimeter on the original drawing.

THE MONTHLY RECORD.

EUROPE.

The Food-supply of the United Kingdom.—A careful study of the question of the food-supply of the United Kingdom, leading to results somewhat at variance with ideas entertained on the subject in some quarters, is contributed to the *Journal of the Royal Agricultural Society* (March 31, 1900) by Mr. R. F. Crawford. The writer begins by estimating the amounts produced at home and imported from abroad of the four fundamental articles of food—wheat, meat, potatoes, and milk—for all these must, he holds, be considered in the study of the problem. The results obtained show that the home contribution is, in the case of wheat, less than 25 per cent. of the whole consumption; of meat, as regards which the state of things is much more satisfactory, about 62 per cent.; of milk (including butter and cheese), about 55 per cent.; and of potatoes, practically the whole. But even these figures are too favourable, for the live stock reared in this country has largely to depend on food-stuffs grown abroad. In view of the difficulty of obtaining the value of these in their converted form, Mr. Crawford attempts to calculate the acreage that would be necessary to produce an equal amount of such food-stuffs at home, finally adding this to the area required to produce an equivalent of the imported supplies of wheat, meat, and milk. The total number of acres so obtained is 22,999,000, this being considered a distinctly moderate estimate. Therefore, as the area now under crops and grass is 47,800,000 acres, it is clear that we could not, as has been thought possible by some, add to our productive surface anything approaching the area represented by the imports of wheat, meat, and milk. On the other hand, the law of diminishing returns precludes the possibility of any large increase of productivity through radical changes in methods of farming, etc. At the end of his paper, Mr. Crawford compares the state of agriculture in the United Kingdom with that prevailing in Belgium, Germany, and France, showing that there is no foundation for the idea that the first-named is able nearly to feed her people from her own soil; and that, judged from the standpoint of productivity, the system of farming in this country is, if anything, superior to that of Belgium, and far ahead of those of France and Germany. This holds good both in respect of the acreage required to feed a given number of persons, and still more in respect of the amount produced per agricultural worker.

Marine Economy of the German Coasts.—Dr. P. Langhans, who has paid much attention to the cartographical representation of German economic statistics, contributes to the fifth number of *Petermann's Mitteilungen* a sketch of the economic relations of the German coast-lands to the sea, with accompanying maps. The shipping statistics of the German ports, shown by symbols on the general map, and, in the case of the most important ports, on special insets, are grouped in the text under the headings "North sea" and "Baltic." Out of a total registered tonnage of 37,786,000 (or 35,517,000 after deducting the amount representing ships calling at intermediate ports during the course of the voyage), 64·9 per cent. falls to the North sea, and 35·1 to the Baltic, Hamburg alone being accountable for 38·5 per cent. of the former. As regards accommodation, etc., for shipping, the two regions are on more even terms, the North sea ports showing a slight numerical superiority as regards wharfs and docks, and those of the Baltic as regards ship-building yards, to the number of which Kiel, the Stettin district, Danzig, and Elbing all contribute a larger share than any North sea port except Hamburg. On the other hand, the Elbe and Weser ports own 83·6 per cent. of German shipping, and Hamburg and Bremen together 72·6 per cent. The fishing industry is

considered firstly in reference to the percentage of the total population engaged on it in the separate "circles," and next in respect of the number of vessels employed at different portions of the coast. A special map shows the distribution of the fishing population, and brings out clearly the high percentages which occur in the circles with a large development of coast-line, such as Rügen, Usedom-Wollin, and the several "Nehrungen." Others, which occur here and there, are to be explained by the presence of special factors, such as the inclusion of a fishing port. The distribution of the industry is not completely brought out by such percentages, for the important modern deep-sea fisheries which have their headquarters on the lower Elbe, Weser, and Ems are entirely overlooked by this method, owing to the general density of the population in those districts, by which the finishing element is swamped. They employ a larger class of vessel than the Baltic coast districts, which latter possess only five registered fishing steamers as against a total of 129 on the North sea. In regard to the number of unregistered vessels, the bulk of which are undecked boats, the Baltic, and especially the coasts of Pomerania and East Prussia, far outstrips the North sea.

The Railways of Austria.*—At the end of 1898 the total length of the Austrian railways amounted to 18,095 kiloms. (11,236 miles), showing an increase as compared with the preceding year of 845 kiloms. (525 miles), or 4·9 per cent. Of that total 7521 kiloms. (4670 miles) fell under the head of state railways, and 10,574 kiloms. (6566 miles) under that of private lines, 2675 kiloms. (1660 miles) of the latter being, however, worked by the State. The total length of lines so worked had therefore risen by the end of 1898 to 10,142 kiloms. (6300 miles), an increase of 7·4 per cent. as compared with 1897. Characteristic of the nature of the country is the fact that full 79 per cent. of the total length represents lines running at a gradient as against 21 per cent. running on level ground; while curves account for 38 per cent., to 62 per cent. of straight lines. The number of passengers carried in 1898 was 126 millions, the number of passenger-kilometres amounting to 439 millions. The opening of the Vienna city railway was one of the causes of the large increase of the passenger traffic, which amounted to 15·2 per cent. (State railways, 26·8 per cent.; privately worked railways, 7·4 per cent.). The increase per kilometre of lines open was 11·6 per cent. (21 and 5·9 per cent. in the respective categories). Goods were carried to the extent of 110,981 million tons (37,565 millions falling to State railways), the increase as compared with 1897 being 6·4 per cent. (State railways, 10·4 per cent.), and expressed in ton-kilometres 9·6 per cent. The total number of accidents was 1626, and that of injured passengers 143, eight cases being fatal. There was, therefore, one death to each 20 million passenger-kilometres.

Official Map of Turkey.—In the summer of 1899 was published the first and larger instalment of the map of European Turkey, corrected, as we learn from the title, by the Turkish general staff, and printed in the fifth section of the Ministry of War in the year 1317 (1899). The portion which has appeared consists of forty-four sheets, while the whole will be complete in sixty-four. In the north it includes Eastern Rumelia, Southern Bulgaria with the neighbourhood of Sofia, the south of Servia, and the east of Montenegro. The parts not yet issued comprise the Turkish peninsulas and the country south of the Macedonian lakes up to the Greek frontier. The map is a revised edition of that published in the eighties by the general staff on the scale of 1:300,000, this being now enlarged to that of 1:210,000. According to the statements of the Military Geographical Institute of Vienna, the older map was little more than a direct reproduction of the general

* Cf. "The Railways of Hungary," *Journal*, vol. xv. p. 533.
No. II.—August, 1900.]

map published by the institute on a similar scale, while even the new Turkish map is based, so far as the western parts are concerned, on the Austrian. For the eastern parts the basis is supplied by the Russian 5-verst map, from which the new scale is derived. Much valuable original material has, however, been embodied in the portion concerned with Albania, Macedonia, and especially the neighbourhood of Constantinople. The relief is shown in brown, by contour-lines drawn at intervals of 50 metres, the respective altitudes being marked. The nomenclature is for the most part given in Turkish cursive characters (*Rika*), but in the eastern sheets this is often replaced by the more legible alphabet of Fuad Pasha. The translation of non-Turkish names is an arbitrary one, whereas the national Turkish nomenclature is reproduced with great clearness. In spite of some defects, the map is to be welcomed as a useful contribution to the extension of our knowledge of the European *terra incognita*.

The Kosovo Vilayet, North-West Turkey.—Dr. Karl Oestreich has lately contributed to the *Abhandlungen* of the Vienna Geographical Society (1900, pts. 4 and 5) a sketch of the geography of the Kosovo Vilayet, which was the scene of his explorations in the autumn of 1898. The journey itself, of which an outline was given in the *Journal* for March, 1899 (p. 301), was fully described in the *Verhandlungen* of the Berlin Geographical Society last year. Dr. Oestreich begins by pointing out that the district in question cannot appropriately be designated by a single name, as it forms a borderland both ethnologically and politically, and at the same time geographically. Although the gathering-ground of many of the rivers of Western Turkey, it does not, taken as a whole, form an upland region, its central feature being the twin plains of the Metojia and of the Kosovo Polje, with the hills which separate them. The first of these plains—the wider of the two—is the collecting-ground for the waters of the White Drin, which breaks through the mountain rim at the southern end of the plain. The second plain, which has more of the form of a valley, sends its waters to the north to the Morava system, and south to that of the Lepenac (tributary of the Vardar), its highest part forming a swampy water-parting. Towards the south this central region is bounded by the plateau of Kacanik, cut by the narrow winding valley of the Lepenac, and formed in the east by the Kara Dag, and in the west by the Šar Planina, the culminating ridge of the whole country. To the west and north the Metojia is limited by the North Albanian alps, which form the edge of an extensive upland with an average elevation of over 3000 feet. To the east the Kosovo Polje (known also as the Amselfeld) is bounded by a mountainous country rising to a height of 4300 feet, and further north, in the Kopaonik range, to one of 6500 feet. The focus of the political and economic life of the region is Ūsküb, the chief town of the Kosovo Vilayet, which owes its importance to its position commanding the chief lines of communication through the country. Besides being about midway on the railway from Nisch to Salonika, it is also the junction for the Mitrovica branch which traverses the Kosovo Polje. To the north-west alone is communication blocked by the Šar Planina, which is crossed by no road or track passable for wheeled traffic. It is this isolation of the Drin basin which has favoured the exclusive character of its inhabitants. Dr. Oestreich describes in turn the principal physical divisions of the country, devoting special attention to the Šar Planina and its bordering heights on the side of Ūsküb.

ASIA.

Bogdanovich's Expedition in North-Eastern Siberia.—The May number of *Petermanns Mitteilungen* contains an account by General Krahmer of the geographical results of Bogdanovich's Okhotsk-Kamchatka expedition, as recorded in a recent paper in the *Izvestia* of the Russian Geographical Society

From Nikolaievsk on the Amur the Russian traveller made the whole circuit of the Sea of Okhotsk, studying the geology and orography of the coast-lands. The district between Nikolaievsk and Okhotsk falls orographically into two distinct subdivisions—the region of the Ud in the south, stretching northwards to Chumukan, and a section of the Stanovoi system in the north. In the former we find a series of more or less parallel ridges running towards the sea and separated by broad swampy valleys, their ends being quite unconnected. They are spurs of the mountain system known as the Little Khingan, which supplies the water to the lower part of the Amur basin, but, owing to the extent of swamp, the district has no specially marked mountainous character. The range north of Chumukan, known here as Jugjur (4000 to 5000 feet), is the immediate continuation of the water-parting between the Amur and Lena, and itself separates the waters of the Arctic ocean and the sea of Okhotsk. The character of the two versants is distinct, the eastern side being characterized by separate ridges, while on the west a wide plateau extends towards the Lena. Near Okhotsk groups of table-topped hills take the place of continuous ranges, while beyond that place the Stanovoi takes the form of a broad chain with separate ridges. The character of the coast-lines of the Sea of Okhotsk varies with the mountain structure, and with the varying angle which they make with the tectonic lines. Evidences of a retreat of the sea, which has been in progress throughout the recent geologic epoch, and has been continued down to the present time, are everywhere visible. Kamchatka is divided by its water-parting—which is at the same time the axis of the peninsula, around which all its features are grouped—into two parts, known to the inhabitants as the west and east coasts. The profile of the central ridge, of which the mean height is 4000 to 5000 feet, is very irregular, its forms being due in parts, especially in the north, to extensive volcanic outflows, and in others to the elevation of single volcanoes, which are more numerous to the south. The western coast-lands generally rise from the sea at a low angle, and are traversed by broad swampy valleys, between which the ground is covered with birch-clad mounds and banks. A large part of the east coast is taken up with ranges and volcanoes belonging to the system of the central chain, but towards the north this is bordered on the east by an open plateau about 1500 feet above the sea, from which it is separated by a narrow strip of lowland similar in character to that on the west coast. With its rocky mountain crests, slopes covered with dense thickets, and poplar woods along the streams, Kamchatka presents a varied landscape. Rocky tundras such as occur in the Stanovoi region are comparatively rare, moist grassy tundras with hillocky surface being more common. Glaciers were discovered on the upper course of the Tigil, where they had not been known to exist. They are not of great size, but have well-developed moraines, and belong to the type of hanging glaciers. The valley below presents a typical glacier landscape. Glaciers also occur on one or two of the extinct volcanoes. The low elevation of the ends of the Tigil glaciers makes it surprising that more of the central chain is not glaciated, but this is perhaps to be explained by the relative position of the ridges and the direction of the prevailing winds.

Two New Russian Railways.—Two railways of great importance are to be opened this month for traffic in the Russian dominions in Asia. One of them is the Transbaikalian branch of the Siberian railway, now ready between Irkutsk and Sryétsensk, on the Shilka. This railway runs 40 miles from Irkutsk to the station "Baikal" on Lake Baikal. There the train is placed on a steam-ferry, which is at the same time a powerful ice-breaker, and is transported to the Mysovskáya station, on the eastern shore of the lake. Then the railway follows the usual highway; that is, it passes through Verkhneudinsk (whence the high-road branches to

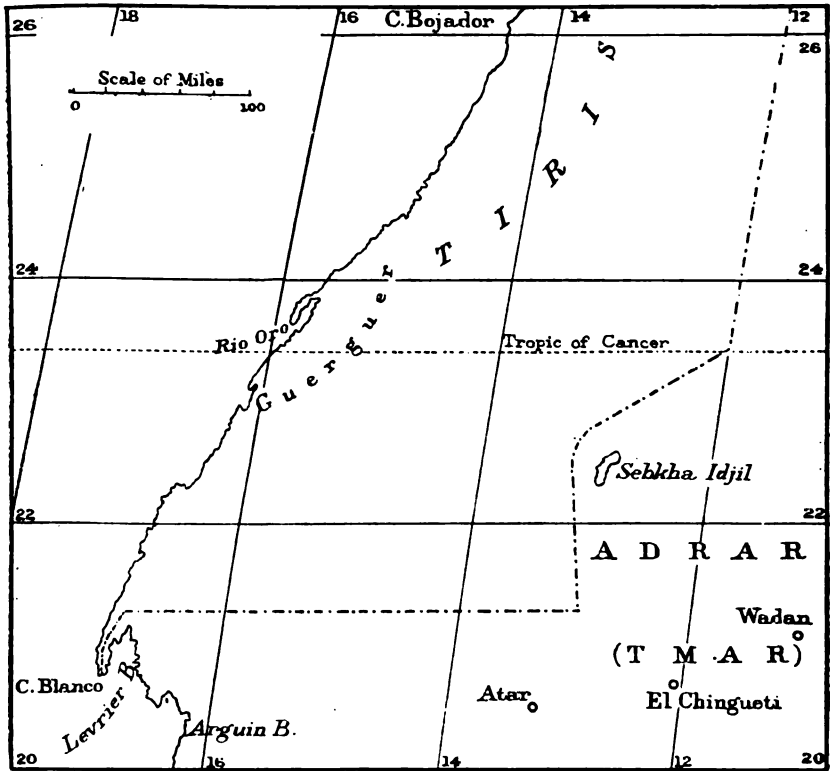
Kiákhta, Urga, Kalgan, and Pekin); then it crosses the Udinsk high plain, slowly reaching a low pass across the Stanovói, or rather the Yáblonovoi Khrebét, where the line reaches, down a rapid slope, Chitá, the capital of Transbaikalia, situated on the Ingodá, tributary of the Shilka. Some 20 miles lower down on the Ingodá stands Kaidalóvo village, where begins the great Trans-Manchurian line running through Chindánt, Tsurukháitu, Tsitsikar, and Mukden, to Vladivostok and Port Arthur. Further on, on the Ingodá, is Nérchinsk (the town, not the mines, which are further east, on the Argun, near the Chinese frontier), and after a course of 240 miles from Chitá, the railway reaches Sryétensk. This spot, which was a tiny village some twenty years ago, is now a rising town where the steamers are docked for the winter, and where large mechanical works have been established lately. The Shilka is there already a beautiful large river, navigable for steamers having not more than 3 to 4 feet draught. From Sryétensk to Khabarovsk, which is the head of the Usuri-Vladivostok railway, the distance along the Amur is, however, still 1300 miles, and the river is under ice from October 15 till the beginning of May. The Caucasian railway is perhaps even more important. Up to the present time, Transcaucasia, *i.e.* the governments of Tiflis, Kutais, Baku, Kars, Batum, and Erivan, were not connected with the Russian railway net. The Caucasian railway, beginning at Rostóff on the Don, went south-westwards across North Caucasia to Vladikavkaz, and to the watering towns around Pyatigóresk; but it stopped there. The Caucasus range was only crossed by rail at its western extremity by a line branching from the main line south-westwards, *viâ* Ekaterinodár, to Novorossiysk on the Black sea. From this port to Poti and Batum, the communication had to be made by steamers. A line of railway beginning at Batum and Poti, crossing the Suram mountains by a tunnel (lately completed), ran along the southern foot of the great Caucasus range to Tiflis, Elisabethpol, and Baku, on the Caspian sea (599 miles); and a branch line of some strategic importance was being built from Tiflis south-westwards to Alexandrapol and Kars. But the Transcaucasian railway was not connected with the North-Caucasian line, and from Vladikavkaz one had to go to Tiflis by means of post-horses through the most picturesque gorge of the Darial. This journey cost 54 roubles in a separate carriage, and from 19 roubles to 5 roubles 40 copecks in an omnibus, while the railway ticket from St. Petersburg to Vladikavkaz costs only 36 roubles 50 copecks in the first-class, and 14 roubles 60 copecks in the third. Now the Transcaucasian railways are connected with the North-Caucasian lines *viâ* Baku. The route is, of course, a very circuitous one, as the main Caucasus range is not crossed, but only turned at its south-eastern extremity along the Caspian shore. It covers 802 miles, instead of the 120 miles which separate Vladikavkaz from Tiflis; and yet the journey from St. Petersburg to Tiflis on that circuitous route will only cost 49 roubles 50 copecks in the first class, and 19 roubles 80 copecks in the third. The new railway branches from the main line at Beslan, 13 miles before reaching Vladikavkaz; then it passes through the fort Gróziyi on the Terek, and reaches the Caspian sea at Petrovsk (180 miles). It runs next for 284 miles close to the shore of the Caspian, through the Derbent gate, to the Balajáry station, 3 miles before reaching Baku, where one has to retrace his steps westwards for 338 miles, along the southern foot of the Caucasus, up the valley of the Kura, in order to reach Tiflis. At any rate, the whole journey from St. Petersburg to Tiflis (2407 miles) can now be made in a railway carriage at a relatively very small cost.

AFRICA.

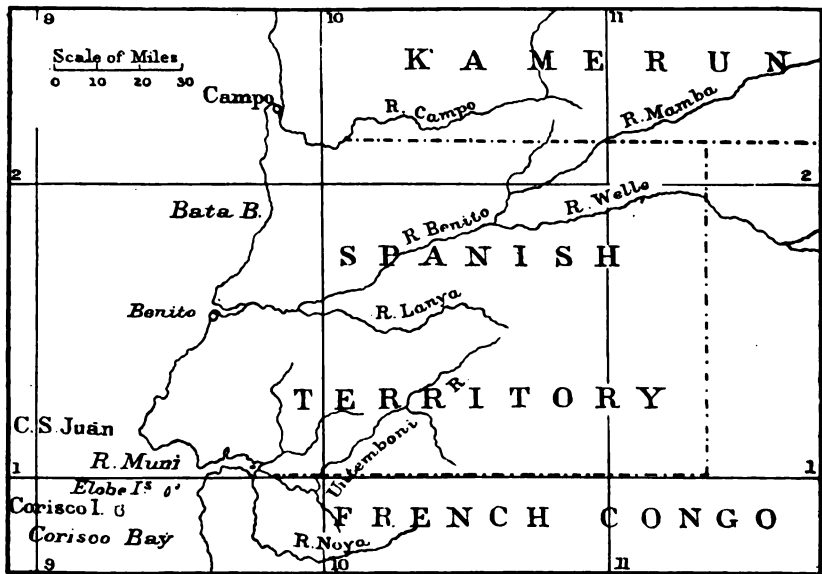
M. Flamand's Scientific Mission to the Tuat Oases.—In the 5th number of *La Géographie*, M. Flamand, leader of the mission despatched last winter under Government auspices to the Tuat oases, gives a summary of the work

accomplished in the various departments of science with which his researches were concerned, which shows that considerable additions to our knowledge of that region have been made. Especial attention was paid to the fixing of geographical positions by astronomical observations, particularly that of Insalah, about which so much discussion has taken place. For the determination of levels, M. Flamand took with him two mercurial barometers, which he took to Insalah and back without accident, thus obtaining results of value as being comparable with previous determinations by the same methods. Observations were made daily at fixed hours at stations on the route, and at the same hours, with identical instruments and under similar conditions, at Tuggurt, Wargla, El Golea, and Ghardaia, stations of the meteorological department. A complete series of meteorological observations was also obtained. Studies of the morphology of the region were made, and light thrown on the *régime* of the weds Igharghar and Niya, and on the composition and influence on the hydrography of the *hammada*, or Cretaceous and Tertiary plateaux of the higher and lower Sahara. Although no great extent of *areg* was traversed, enough dunes were seen to permit the elucidation of all the phases in the formation of an *ery*. Geological researches were carried out in the Tertiary and Pleistocene formations of the Saharan basins, in the Cretaceous of the Tademait, and in the sandstones of the primary series north of Meguiden. In connection with the applied hydrology of the region, a special study was made of the supply of water to the oases by means of *feggaguir*, or underground galleries. Interesting information was also collected as to the mutual relations of the different sections of the population. It was found that, far from being a source of supply to the Tuareg, the Tuat archipelago—such is the collective name applied by M. Flamand to the oases of Gurara, Tuat proper, and Tidikelt—depended upon the latter, at least in the eastern part, for many of the prime necessities of life, which are given in exchange for the dates of the oases. The inhabitants of the latter, in case of attack by the Tuareg, retire with their flocks to their *kasba*, behind the walls of which they find sufficient protection.

Franco-Spanish Boundaries in West Africa.—A convention has been signed between France and Spain for the settlement of the long-standing questions respecting the mutual frontiers of the two countries in West Africa (see accompanying sketch-maps). The text of the arrangement has not yet been published, but the details given in the French papers make known the broad results, which are also shown on sketch-maps published in the *Dépêche Coloniale* for July 4. In the Sahara, where the frontiers of the respective territories on the coast were fixed by the agreement of 1890 (which gave Spain the section between Capes Blanco and Bojador), the difficulties as regards the interior have been settled in the sense that Spain abandons her claims to Adrar, the boundary-line bending to the west of that country, and likewise leaving to France the Sebkha, or dry salt lake, of Ijil, which supplies salt to the caravans proceeding to the Sudan. North of the Tropic of Cancer, the interior limit of the Spanish territory seems to be the twelfth meridian west of Greenwich. In the neighbourhood of the equator, where, though Spanish occupation has been practically limited to the islands of Corisco and Elobe in Corisco bay, a claim has been made both to the shores of the bay and to a hinterland stretching indefinitely towards the centre of the continent, the interior limit has been fixed at $11^{\circ} 20' \text{ E.}$ (9° E. of Paris). On the coast, France secures the greater part of Corisco bay, the frontier following the *thalweg* of the Muni to 1° N. and afterwards that parallel to its intersection with the meridian above mentioned. In the north Spanish territory extends to the frontier of the Cameroons, formed on the coast by the mouth of the Campo. That even so large an extent of country is recognized as Spanish is regarded in France as a concession, agricultural undertakings



CAPE BLANCO AND ADRAR REGION.



MUNI RIVER REGION.

having already been started by French companies within the limits now fixed. Spain, however, accords to France the right of pre-emption in respect of this area, while similar rights are conceded to Spain in respect of Adrar. By this agreement the last of the questions affecting the boundaries of the French African possessions with those of other European powers has been settled.

M. Blanchet's Expedition to Adrar.—As we have already announced, an expedition was organized at the end of last year by the Paris journal *Le Matin*, for the further study of that part of the Sahara lying between the French possessions on the Niger and Algeria. The command was entrusted to M. Blanchet, who had already done good work in the south of Algeria, but who this time started from the Senegal, the country of Adrar, recognized as under French influence by the recent Franco-Spanish convention, being his first objective. According to the *Dépêche Coloniale* of July 5, disquieting rumours regarding the expedition have lately reached Saint Louis, a portion of the native escort of the mission having returned from Adrar with the news that the Europeans of the party had disappeared after a conference with the Moorish chiefs. During the early stages of the expedition, some difficulties had been encountered, but it had been hoped that these were successfully overcome. M. Blanchet, who had with him a capable native as interpreter, hoped to establish friendly relations with the Uled-bu-Saad and other tribes, and it is thought possible that he may have been residing with one of their chiefs while awaiting permission to enter Adrar. It is said that one of the objects of the mission was the search for deposits of nitrates and phosphates, which the analogy which has been noticed between the Western Sahara and the desert regions of Chili has led some to consider likely to be found in the former region.

Jibuti as a Port.—In the *Politique Coloniale* for May 3, M. L. Henrique calls attention to the natural advantages possessed by Jibuti as a port of refuge and supply, and regrets the fact that the credits lately voted for the strengthening and improvement of French naval stations are not to be drawn upon for its requirements. M. Henrique holds that the port possesses merits equal, if not superior, to those of Aden, owing to the facilities which it presents for the loading and unloading of coal, and the presence of an excellent supply of water and fresh provisions. He points out that the almost enclosed basin of Gubet-Karab, at the head of the Gulf of Tajura, could with ease be turned into an impregnable harbour of refuge, to which a branch from the Harar railway might supply land communication with Jibuti. In its present state the latter would be at the mercy of a single company of troops. The subject is recurred to in the issue of the same paper for June 22, which contains charts with soundings of the Gubet Karab above alluded to, and of the Baie de l'Étoile within it, which offers special advantages as an anchorage.

The French in the Western Sudan: Navigation of the Middle Niger.

—Of the many French expeditions which during the past year have been active in the western Sudan, one of the most important was that of M. Baillaud, who, setting out in a canoe from Kulikoro early in 1899, navigated the whole Niger from that place to Say. During the return journey, which was made across the bend of the Niger by Dori and Wagadugu to Jenne, he collected valuable information respecting native trade-routes, etc. His further route to Medina on the Senegal led, after passing Bamako, in a direction not often taken by Europeans. M. Baillaud had been preceded in his voyage down the Niger by Captain Granderye, who successfully solved the problem of provisioning Say and other posts by way of the river, thus avoiding the difficult march across country. He made the voyage with fourteen boats of various kinds without losing one, and it is said that this route to the lower French posts will be generally adopted in the future. A journey

made by M. Coppolani, on the borders of the Western Sahara, north of the Senegal and Niger, was also carried to a successful issue. From Guirel, north of Segou, the traveller pushed into the Sahara to Medgarua, in the direction of Tagant.

Mr. Moore's Expedition to the Central African Lakes.—We are enabled to give some additional details respecting Mr. Moore's expedition to Lake Tanganyika, the most important results of which—especially the discovery of the maximum depth of Lake Nyasa (430 fathoms) and the shifting of the position of Lake Tanganyika to the west—have been from time to time recorded in the *Journal*. During the stay at Blantyre, the time was telegraphed to Mr. Fergusson from Cape Town, by arrangement with Sir David Gill, and the error of the watches thus accurately determined. This was done again at Nkata bay, the longitude of which had been fixed by the Anglo-German boundary commission, and at Kituba, on Lake Tanganyika, the value of Mr. Fergusson's astronomical observations being thus greatly enhanced. Had the same facilities been available at the north end of Lake Tanganyika, the new position assigned to the lake could be accepted with complete confidence. Mr. Moore succeeded in making a large collection of fishes from the lake, including some new to science. He also carefully examined the neighbourhood of the Lukuga outlet, the former blocking of which by vegetation he found it difficult to believe. North of Tanganyika, Mr. Grogan's route up the Rusizi valley was followed to Lake Kivu. Two volcanoes were found in a state of activity north of the latter, one of them being presumably that ascended by Count von Götzen in 1894. Like Mr. Grogan, Mr. Moore throws doubt on the existence of Mount Mfumbiro, which has figured on our maps since Speke's time. It may be pointed out, however, that the question is merely one of nomenclature, and that the easternmost of the line of volcanic peaks north of Kivu, ascended two years ago by the German Captain Bethe, was said by him to be known as Kirunga ya Ufumbiro (Count von Götzen's volcano being Kirunga cha Gongo). Proceeding round the west side of Lake Albert Edward, Mr. Moore crossed the Semliki, and examined the neighbourhood of Mount Ruwenzori, which he considers as a mountain range rather than an isolated mountain block. It has many jagged peaks, and extends along the eastern shore of the Albert Nyanza. The peak ascended, which Mr. Moore claims to be the highest of the range, is assigned a height of 16,500 feet, the snow-level being placed at about 13,000. It is not stated, however, on what observations these altitudes depend. From the Albert lake, where additions to the collection of fishes were made, Mr. Moore proceeded to Uganda, and thence to Mombasa, in part by the new railway. The results of the expedition as regards the geological history of the Central African lakes have already been announced.

M. Prins' Explorations in the Shari Basin.—We have before alluded to the geographical work done by M. Pierre Prins, one of the members of the Gentil Mission to Lake Chad, who was left behind by the leader as French representative in Baghirmi. M. Prins' most important exploration was that carried out during a journey from the Gribingi to the camp of the Sheik Senussi of Dar Runga, between November, 1897, and January, 1898, on which many headstreams of the Shari were for the first time crossed near their sources. A summary of the geographical results of the journey, with sectional map of the route, appears in the third number of *La Géographie*, together with an account of M. Prins' subsequent voyage down the Shari to Baghirmi. The map alluded to merely gives, in seven sections, the results of the route survey, and does not therefore present a connected view of the geography of the region. This has, however, been given by M. Wauters in the eighteenth number of the *Mouvement Géographique*, in a map in which the results of the journeys of M. Hanolet and other Belgian officers are also shown. Starting north-east from the French station on the Gribingi, M. Prins crossed the

Bamingi, the main headstream of the Shari, after travelling about 70 miles. It was there some 80 yards wide and 13 feet deep (in December), with a mean velocity of less than a mile an hour, and is probably navigable to the confluence with the Gribingi. Its left-hand branch appears to be the Kukuru of Dybowski, rising in about $7^{\circ} 30'$ north. A little north of the river, Mount Badzo, an isolated granite peak, typical of those scattered over the plains of Dar Runga, was seen. After passing the Balijia range, the route inclined to the east, crossing the Bangoran and other streams, which rise in a range of hills separating Dar Runga from Dar Banda. Granite forms the principal foundation of the country, which, as a rule, is poor in humus. Iron is everywhere abundant. In the basin of the Gribingi manioc is the staple article of food, but beyond the Balijia mountains it is replaced by various kinds of millet. North of 8° N. lat. the arid regions commence. M. Prins collected much information concerning the history and ethnography of the regions traversed. The advent of Mohammedan influence into the regions south of Wadai was ascertained to date from fifty years back, but the religious propaganda is lax in character. The native tribes are various branches of the Banda family. During his voyage on the Shari, M. Prins executed a complete survey of the river from 7° N. to within 40 miles of Lake Chad, and his account supplements in many particulars that of M. Gentil, who saw the river at high water only. He considers that it would be navigable at all seasons for stern-wheel steamers drawing not more than 2 feet when loaded.

The Congo Telegraph.—We learn from the *Mouvement Géographique* that the telegraph line destined to place the Upper Congo in communication with the Atlantic coast has already reached the equator on its way up the river. The chief difficulty encountered has been the passage across the mouth of the Kasai, which at the spot chosen has a width of nearly three-quarters of a mile. The wire is supported by three pillars, one on either bank and one on a rocky islet in mid-stream, two of them reaching a height of 150 feet.

AUSTRALASIA AND OCEANIC ISLANDS.

The Australian Aborigines.*—The recently published work of the Rev. John Mathew brings together in a compact form the salient facts relating to the physical and mental characters of the Australian aborigines, besides dealing with the more special question of the origin of the Australian race, a subject to which the author has devoted special attention for some years. This is treated of in the first four chapters, in which Mr. Mathew enlarges upon the views previously put forward in 1889, in a paper published by the Royal Society of New South Wales. The existing characters of the Australian aborigines are accounted for by the supposition that, far from being a homogeneous race, as has been held by some former observers, the people in question show a mixture of three distinct elements, Papuan, Dravidian, and Malay, the first-named forming the original element, while modifications have been introduced by subsequent immigrations of the other races. The general idea of this theory had already been hinted at among others by Flower and Lydaker, but is now followed up in fuller detail, and supported by evidence collected from the whole field of Australian ethnology. That the primitive base was Papuan (the term being used in its widest sense), and that this was common to Australians and Tasmanians, is, Mr. Mathew holds, proved by facts from the domain of physiology, mythology, implements, customs, and language. The term Dravidian, used to denote the earlier of the invading elements, is used merely to imply a community of origin with the Dravidians of India, and not a direct descent from the latter. This element is seen chiefly in the Australian system of kinship

* 'Eaglehawk and Crow: A Study of the Australian Aborigines.' By John Mathew, M.A., B.D. London: Nutt. 1899.

and linguistic characters. Malay influence has been slighter, but may account for the absence of woolly hair, and has left some few marks upon the language. The influx is supposed to have taken place from the north-east, and (in the case of the Dravidians) to have poured chiefly down the centre, while the Malay invasion was more sporadic. The three elements may thus be compared with the Keltic, Saxon and Norman in Great Britain. In the latter part of the book the author undertakes a systematic examination of the Australian languages, suggesting a new system of classification.

Austrian Explorations in the Solomon Islands.—The Austrian gunboat *Albatros* was despatched, in 1895, on a scientific voyage to the Pacific ocean, during which particular attention was devoted to an examination of the hydrography, meteorology, and general geography of the Solomon group, where the ship made a lengthened stay in 1896 and 1897. The report on the voyage, by the commander, Captain J. von Mauler, appears in the *Abhandlungen* of the Vienna Geographical Society (1900, Nos. 4 and 5), together with a sketch of the meteorological results by Lieut. Kesslitz. From Sydney a course was laid for the Thousand Ships bay at the south end of the island of Isabel, which it separates from the smaller island of Tuilagi. The bay was carefully examined, and an inlet discovered on its south shore, which affords good anchorage for a limited number of vessels. The narrow channel with low wooded shores (Ortega channel), by which the bay is connected with the sea to the south of Isabel, was also examined, as well as the south-west coast both of Tuilagi and the main island. In the latter, a considerable river was discovered, and named Foullon, after Baron von Foullon-Norbeeck, the geologist of the expedition. Its valley was ascended for several days' march to the Marescot mountains, which were found to be inhabited, though nearer the coast no trace of population was seen. An elevation of 3600 feet was reached, which seemed to be only some 500 feet below the highest summits of the Marescot range. A view was obtained over the northern part of the island and the extensive coral banks on that side. Seen from the south, the whole of Isabel presents the appearance of a mountain chain, which runs from the above-mentioned range, past the Lafarge peak, to the north-west end of the island. The coast is bordered by low hills, divided from the sea by mangrove swamps. A good anchorage was discovered abreast of Mount Lafarge, to which Baron Foullon made a six days' expedition, passing through an exceedingly broken country. Leaving Isabel, the expedition proceeded to Savo island, the volcano of which was ascended. Though not at present active, it does not appear to have been long at rest, and steam was seen to issue from various points in the crater. Between Savo and Guadalcanar no trace could be seen of the dangers marked on the British charts. An area of discoloured water was found to be not caused by shallows, but was apparently due to unexplained local causes. After various cruises along the north coast of Guadalcanar, an expedition was undertaken to the Lion's-head mountain, which resulted in the death of Baron Foullon and several of the crew by a treacherous attack of the natives. The party had reached, after four days' march, a height of 3400 feet, and was, at the time of the attack, attempting the ascent of a steep peak named Tatube, 4200 feet high, a mile or two north-east of the Lion's head (Popomanisao of the natives).^{*} It was only after the greatest exertions that the survivors of the party,

^{*} This is apparently the peak since ascended by Mr. Woodford, starting from the opposite coast (*Journal*, vol. xv. p. 71); but it is not easy to fit the two accounts to each other. According to Mr. Woodford, Popomanisao lies south of the main watershed of the island, while the reverse is shown to be the case in the sketch-map accompanying Captain von Mauler's paper.

including several wounded men, succeeded in reaching the ship. After these events the ship returned to Australian waters, but afterwards resumed work in the Solomons, again visiting Guadalcanar and Isabel, and executing important hydrographical surveys near the north-west end of the latter. The coast was found here to be entirely different from its delineation on the British Admiralty chart, being bordered by lines of islands enclosing an extensive sound, named Austria sound by the navigators. Parts of this occupy positions shown on the chart as mainland. The return voyage was commenced after a visit to Taura peak on Choiseul island.

Trade and Agriculture of Samoa.—The annual consular report on the trade of Samoa during 1899 records a great increase in the value both of imports and exports as compared with previous years. The bulk of the trade was done with the British empire, imports from which had more than doubled since 1897, while, owing to the rising demand for copra in the Australasian colonies, the exports to the British Empire had risen from £5000 in 1897 to £60,000 in 1899. Exports are restricted to three products—copra, cacao, and fruit, cotton and coffee having disappeared from the list. The production of cacao is still in its infancy, but the quality is excellent, and energetic measures are being taken to extend the plantations. Rubber, kola, and vanilla are also being planted, and may form important resources in the future. In an article in *Globus* (vol. 77, No. 8), Dr. Reinecke discusses the agricultural potentialities of the German islands, arriving at the conclusion that, with the termination of the late period of disorder, a great future is open to the islands. He estimates the area of fertile land suitable for plantations as from one-fifth to one-fourth of the whole surface of Upolu. Conditions are somewhat less favourable in Savaii, where the question of water-supply presents even greater difficulties than on Upolu. From the sketch-maps which accompany the paper, it appears that the plantations owned by Germans on the latter exceed in area those of all other nationalities, but that they fall somewhat behind on Savaii.

POLAR REGIONS.

The Danish Expedition to East Greenland.—The administration of the "Carlsberg Fund" in Copenhagen has, as already stated,* provided the means—about £8300—for sending an expedition to explore a difficult part of the east coast of Greenland, the ice-bound coast from Angmagsalik, about 66° N. lat., where the Danish Government has established a station in 1894, and northwards to Scoresby sound, about 70° N. lat. It was agreed that the leader, Lieut. G. Amdrup, R.D.N., should first go up to Angmagsalik in August, 1898, winter there, reconnoitre the coast, lay out depôts with boat and dog-sledges, and explore the tract in the vicinity of Angmagsalik, a tract of special botanical interest. After having executed this first plan with much energy, Lieut. Amdrup and his party returned to Copenhagen in September, 1899.† To execute the second and last part of the plan, the expedition left Copenhagen on June 14 of this year in the *Antarctic*, that had been bought for the purpose. The *Antarctic* is the vessel known from the expeditions of Dr. A. G. Nathorst. It is the intention of Lieut. Amdrup, with three companions—a naval petty officer, a mate from the merchant service, and a sailor-smith—to leave the ship at a convenient point south of Cape Brewster, after having penetrated the ice-belt, and then try to reach Angmagsalik, which perhaps may be done this year. The petty officer and the sailor-smith accompanied Lieut. Amdrup in 1898-99. Lieut. Amdrup is provided with boat, sledges, kayaks, provisions for two years, and a little house, in which the expedition can winter on the inhospitable coast. When all these things have been landed, the *Antarctic*, which carries a

* Vol. x. p. 218.

† Vol. xiv. p. 449.

staff of scientific men, will leave to explore the tracts at Scoresby sound and the nearest northern fjords, and then pursue scientific investigations in the Angmagssalik district. The ship will not winter, and it is possible that Lieut. Amdrup and his party may return to Copenhagen with it in the autumn. When he has left the ship, Mr. N. Hartz, botanist, who has accompanied two expeditions to West Greenland, and wintered in Scoresby sound 1891-92 with the expedition of Lieut. Ryder, R.D.N., takes the command. The scientific staff, whose members almost all have some experience in arctic expeditions, consist further of Ch. Kruse, botanist; H. Deichmann, entomologist and ornithologist; S. Jensen, zoologist; Lieut. J. Koch of the army, surveyor; the Swedish Dr. O. Nordenskjöld, geologist; E. Ditlevsen, painter. The zoological garden in Copenhagen sends an assistant, Mr. Madsen, with the expedition in order to try to catch some musk-oxen for the garden.

Arctic Exploration in New Siberia.—A sledge expedition, auxiliary to Baron Toll's, will start from St. Petersburg in the autumn, under K. A. Volossovitch, naturalist, who will be accompanied by a topographer. It is expected to reach Ust-Yansk in December. Then, with two Cossacks and seven or eight Yakuts, the explorers will go on sledges to the New Siberian islands. On the Lyakhoff island they will separate; the topographer will go to the New Siberia island, while M. Volossovitch will proceed to Kotelniki, and through the Anjou peninsula, move along the northern coast of the New Siberia island, joining there the topographer at the Wood Mountains. The chief aim of the expedition is to ascertain the state of the previously made depôts of food, and the establishment of new ones, for Baron Toll's expedition.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

A New Geomorphological Theory.—M. Marcel Bertrand has published in the *Comptes Rendus* of the Paris Academy of Sciences (vol. 130, p. 449) for February last an important article in which he endeavours to combine the theory of Lowthian Green, that the figure of the Earth is based on a tetrahedron with its apex at the south pole, with the theory of Michel-Levy, that the Tertiary rocks of the Earth are distributed along the edges of a tetrahedron, the apex of which lies some 20° from the south pole. This suggests the idea of associating the movement of the pole of the Earth with the tetrahedral deformation of the crust. Going further, M. Bertrand shows that if lines be drawn through all the active volcanoes of the present day, they are found to lie along six slightly deformed great circles which outline two tetrahedra set base to base. These lines of volcanic activity indicate the places where the heavy molten rock-material lies nearest to the surface, where in consequence are the geosynclinals which precede the formation of mountain chains. All the mountain chains, except the Andes, are found along the edges of the northern of the two tetrahedra, which indeed is far from being regular, yet, taken as it is, it has proved to be a remarkable instrument of research. One summit of this tetrahedron lies on the polar circle, and M. Bertrand states his belief that originally the axis of the tetrahedron passing through this summit, the axis of the Earth, and the axis of the ecliptic all coincided, and he considers that the displacement of the axis of the tetrahedron from that of the Earth being the same as the displacement of the axis of the Earth from that of the ecliptic is not accidental. In order to account for the phenomena of the movement of the terrestrial pole over the surface of the Earth, it is necessary to consider the crust as distinct from the interior—to look on the Earth, in fact, as resembling an orange with a movable skin. The superficial tetrahedron is assumed to be due to differences of gravity brought about by an internal tetrahedron outside the neutral zone separating the outer zone of 350 miles thick

from the undeformed nucleus. M. Bertrand goes on to discuss the position of the summits of the terrestrial tetrahedra at the different geological periods by considering the places of occurrence of the various formations, and thus from purely geological evidence to deduce the wanderings of the summit of the tetrahedron over the surface of the Earth. Finally, he indicates how, if the tetrahedron be supposed to have been originally a regular figure, its present degree of deformation furnishes a datum for calculating the age of the Earth. He concludes, "The tetrahedron is the great mechanism, put into action by the cooling of the Earth, which guides and regulates all the movements of the surface; the transmission of these movements being brought about solely by the inequalities of gravity to which they give rise. The entire mechanism is regulated with so admirable a precision, that these minute differences suffice to set the whole into motion. When the period, happily still far distant, arrives when the tetrahedron has acquired its position of equilibrium, the central mechanism will stop, the movements will gradually die out, denudation will level everything, for there will be no counter-influence, and the geological life of the Earth will come to an end." In a paper read to the Academy at a subsequent meeting, M. de Lapparent points out that M. Bertrand's modification of Green's theory detracts from the complete applicability of his eloquent peroration, which would be much more nearly true of Mr. Green's conception of the gradual passage of the Earth's figure from a sphere, which has the minimum of surface for its volume, to a tetrahedron, which has the maximum of surface. This, he points out, does not hold good for M. Bertrand's hypothesis of two tetrahedra united by their bases, *i.e.* giving the Earth the form of an irregular hexahedron. He warns geologists against being led away by the seductive appearances of a learned and ingenious theory from a much simpler explanation of the facts which nothing has yet been brought forward to confute.

The Glacier Conference of 1899.—The fourth number of *Petermanns Mittheilungen* for the present year contains the report by Prof. E. Richter on the conference which met last August at Gletsch, in Wallis, at his invitation, to discuss points of interest relative to the science of glaciers. The proceedings of the conference, at which some sixteen scientists took part, consisted both in discussions and in visits of inspection to various sections of the Rhone glacier, and, as a practical result, a number of resolutions and recommendations were arrived at, having reference to points of nomenclature, questions of glacier-structure, and desiderata for future work. They are printed in full as appendices to Dr. Richter's paper, and only a general idea of their tendency can be given here. Three of the resolutions related to the special phenomena of the Rhone and lower Aar glaciers, while others dealt with the classification and nomenclature of moraines, and the points deserving of special research in the future. It was decided that moraines should be classed under the two main headings of moving and deposited moraines, each of these divisions being again twice or more subdivided according to their vertical or horizontal position, etc., terms for each kind being fixed in German, French, and English. The determining factors in the classification of moraines, both in reference to their composition and mode of origin, were also laid down. Sixteen desiderata for future research were tabulated under the four headings of (a) structure, (b) moraines, (c) movement and temperature, (d) economy. Under the last heading are included points relating to the volumes of glacier streams and the amount of precipitation over their collecting-grounds, the seasonal variation in the amount of mud carried by the streams, etc. The points put down for investigation under the third head include the determination of the rate of movement at different depths, and of the vertical component in surface-movement, the elucidation of differential movements of the ice, and of seasonal variations. Among miscellaneous resolutions

was one by which the term "stratification" was restricted to its geological sense, as, *e.g.*, when used in reference to the deposits in the region of *névé*; the term "banding" being chosen to designate the alternation of layers of ice of varying character.

Comparative Studies in Climate.—Prof. Hildebrandsson has continued his investigations into the meteorological conditions of the "centres of atmospheric action," by examining the deviations from the mean rainfall at the most important centres for which he could obtain data. The results corroborate those of his previous researches on variations of pressure. They point to a constant opposition between the deviation from the mean atmospheric conditions at Iceland and the Azores (the low and high pressure centres of the North Atlantic), and in winter a constant agreement between those of the Azores and Central Siberia (both high pressure centres in winter), and also at stations between them along the high-pressure axis. In summer the rainfall like the pressure indications are not so sharply contrasted or so coincident. From October to March the deviation curves of Mauritius and East Australia—New Zealand are opposed; and also those of Alto da Serra, Brazil ($23^{\circ} 40' S.$, $46^{\circ} 30' W.$), and Cordoba, in Argentina. The value of these important researches on practical affairs is very great, and the Upsala professor points out several interesting relationships. One of the most important of these is that the deviations of rainfall from the normal in Siberia from October to March is in general inverse to that in India in the following summer. Unfortunately, this rule has important exceptions about once in ten years, for two have occurred in twenty-one years. The winter rainfall at Thorshaven, in the Faeroes, has the same character, above or below the mean, of the previous summer at St. John's, Newfoundland, and of the following summer at Berlin. Professors Pettersson and Meinardus have pointed out relationships between the temperature of the Gulf Stream and meteorological phenomena in Western Europe. Both, however, may have a common cause, for there is an exact agreement in the trends of the rainfall curves for the winter in British Columbia and the following autumn in the Azores, during the fifteen years for which data are available, and here one ocean current does not affect the two places. The need for regular observations at the centres of atmospheric action is obvious. It is important that new stations should be formed, *e.g.*, at St. Helena (*Kongl. Svenska Vet. Akad. Handlingar*, Band 32, No. 4).

GENERAL.

Murray's Handy Classical Maps.—Four of these useful and scholarly sheets have been published—Hispania, Gallia, Britannia, and Italia—the last on a larger scale and in two map-pages. Each has a full index of all the names marked in the sheet; thus Italy runs to nine pages (five-columned) of place-names. Important modern names are included, as well as ancient; the chief variations of the coast-line are indicated in fainter marking. As to this last point, in reference to Roman Britain, some good judges think the southern shore of the Humber has been greatly altered, and this perhaps might have been taken into greater account, as it is in the region of the Wash. In the same map the question of the forest region presents great difficulties; and the extent of this region in the Selwood country of the south-west, in the midland forest of Arden, in the district of Elmet, round the modern Leeds, and in the great northern forest of Selkirk occupying the basin of the upper Tweed, Ettrick, and Teviot, might have been shown more fully. One-third of Britain was covered with forest at the Roman occupation, and this fact has received attention in some other parts of the map, as in the south-east, where the Andreds-Weald between the South Downs and the valley of the lower Thames is very well given. Yet Selwood and Arden were certainly quite as formidable barriers to the English conquerors; and hardly less serious were the obstacles of

the forest of Wyre on the middle Severn, stretching almost as far as the county of Cheshire; of the woodland track between Hampstead and the Fen country; and of the forests of Sherwood and Needwood filling the bulk of the space between the peak of Derbyshire and the Trent. Referring again to the question of the Fenland of early Britain, this might have been considerably extended—on one side further up the river Witham, quite to the neighbourhood of the Lincoln rise, and on another side along the lower course of the Parrett in Somerset. "To realize the Britain of the Roman age, we should perhaps take the Northern Russia of our own, a country into whose tract of forest lands man is still hewing his way, and where the clearings round town and village hardly break the reaches of silent moorland or as silent fen." Even at the close of the Roman occupation, the river valley was still often "mere strips of culture which threaded their way through a waste." In this map the hill markings seem to be clear and adequate, like the river-courses, though greater breadth might have been suggested for some of the latter at this early time (*e.g.* the Lea). The indication of the Roman roads, fortresses, and harbours are matters to which great attention has been given, and these appear to be thoroughly well done. But the fulness of the reconstruction on this side must be balanced by an equally full treatment of the natural difficulties, if we are to escape the impression of a country more civilized, populated, and "subdued to the use of man" than was really the case till a later period. Some of the chief centres of industry and mining in early Britain are shown in this plan, such as the lead-mines to the south-west of Bath and the iron-mines in the forest of Dean; but no clear indication is given of the mines of Cornwall, perhaps the most famous, if not the most extensive, of all our ancient metal works, or of the mineral deposits in the neighbourhood of Droitwich and Alcester. In the publication of these handy maps, which well deserve their title, every care has been taken to secure a good result. The colouring is distinct, the general outline is well marked, and the accurate shading of the various elevations should be useful to all students. A great deal of trouble has been taken in the preparation of these sheets, but the firm which published Stanley's 'Sinai and Palestine' has long ago given us even more detailed work in the same kind of cartography. For a map showing land-formations in heights and depths, an excellent result is obtained by relief maps, such as are given in Frye and Herbertson's 'Illustrated School Geography,' pp. 104, 142, etc.; and indeed such effects, catching so well the appearance of an actually raised surface, are more satisfactory than those attained by colour methods only. The natural difficulties of Britain at the close of the Roman occupation are in some ways better presented, though with some omissions and on a smaller scale, in the general map facing p. 26 of Green's 'Making of England,' and in the sectional maps on pp. 41, 59, 70, 77, 88, 99, and 126 of the same volume. But the mere publication on separate sheets of serviceable and fairly large-scale maps of the chief countries of the Roman world is in itself a thing for which every reader of ancient and mediæval history must be thankful.

The Ground-plan of Towns.—In the sixth number of the *Zeitschrift* of the Berlin Geographical Society for 1899, Dr. Otto Schlüchter discusses the various forms observable in the ground-plan of German towns, and their mode of origin. The study is to a large extent based on previous literature—much of which is, however, not widely known—and in particular on a work of J. Fritz, which formed an appendix to an educational syllabus issued at Strasburg in 1894. Dr. Schlüchter, however, extends the inquiry in certain directions not followed up by Fritz. The latter drew a broad distinction between the towns of Western and Southern Germany and those east of the Elbe. The former he considered to be, as a rule, quite

irregularly grouped around a central core, which represented either an original village or a religious or military foundation; while the towns of Eastern Germany were shown to owe their form to a distinct design, imposed by their founders at the time of the Germanizing of the east. The plan of the latter consists of a square or oblong market-place in the centre, while the streets run in straight lines at right angles to its sides. The orientation is, as a rule, in accord with the cardinal points of the compass. The whole is surrounded by a circular or elliptical rampart with a general diameter of some 500 yards, both the form and the nature of the fortification being probably of Slav origin. In certain cases this form is repeated once or even twice, as at Rostock, where three sections of the same general plan occur side by side. Such forms are also found in Western Germany, with slight modifications, and their prototype seems to be the Roman *castrum*. Dr. Schlüchter enters more minutely into the subject of the irregularly built towns of the west than was done by Fritz. He is of opinion that a certain amount of design may be traced in their plan, pointing out that even the field-paths, which in some cases determined the direction of the future streets, must have been traced with some distinct aim. A radial arrangement, affording the easiest means of access from the several gates to the market-place at the centre of the town, is, he thinks, generally to be noticed, while the influence of river-courses in determining the direction of the streets is often observable. The action of a central authority is especially noticeable in relation to the fortification of towns. The paper ends with a sketch of the historical development of town plans down to the present day, when regular patterns, little adapted to meet the requirements of traffic, are so much in favour.

OBITUARY.

Lord Loch.

A ZEALOUS and devoted servant of the British Empire has passed away in the person of Lord Loch, who died in London on June 20, at the age of seventy-three years. During the earlier part of his life, before definitely adopting the career of civil work with which his name is now associated, Lord Loch had passed through the most varied experiences, serving both in the navy and army, and undertaking other work abroad of an equally adventurous kind. With the navy he was connected only during his very early years, for after two years' training as a midshipman, being then only seventeen, he joined the 3rd Bengal Cavalry, taking part in the Sutlej campaign of 1845. His next active service was in the Crimean war, in preparation for which he was entrusted with the special task of organizing the Turkish troops in Bulgaria. Leaving the army at the close of the war, he, in 1856, accompanied the expedition to Canton, afterwards joining Sir F. Nicholson and Captain Osborn on an exploring expedition up the Pei-ho river. In 1860 he accompanied Lord Elgin as private secretary during his second embassy to China, and after the outbreak of hostilities underwent a terrible experience, being taken prisoner with Mr. (afterwards Sir Harry) Parkes, loaded with chains, and thrown into a Chinese dungeon amid criminals of the lowest type. The prisoners finally escaped only a quarter of an hour before the arrival of an order for their execution.

In 1863, after a short period of service as secretary to Sir George Grey, Mr. Loch became lieut.-governor of the Isle of Man, where, with his wife whom he had married in 1862, he spent eighteen happy but uneventful years. In 1884 he became governor of Victoria—a post which he filled with much success—and in

1889 governor and high commissioner at the Cape, where questions of unusual difficulty confronted him. In 1895 he retired, and received a peerage. He leaves widow and three children, the only son being a lieutenant in the Grenadier guards, and now serving on the staff in South Africa.

Lord Loch joined the Society so long ago as 1859, and after his retirement served on the Council for several years.

Major-General Sir R. Murdoch Smith, R.E., K.C.M.G.

By Sir FREDERIC J. GOLDSMID, K.C.L.E., C.B.

By the death, on the 3rd inst., of Sir Robert Murdoch Smith, not only has the department of Science and Art in Edinburgh sustained the loss of an earnest and intelligent director, but H.M. Government will miss one of its best authorities on Asia, as regards local geography and the manners and customs of its people. It is probable, moreover, that few, if any, of our diplomatists had a truer appreciation of the deceased officer of both the foibles and redeeming features of the Persian national character.

Son of Dr. Hugh Smith, of Kilmarnock, he was born in August, 1835, and appointed lieutenant Royal Engineers in September, 1855, captain in 1864, major in 1873, lieutenant-colonel in 1881, colonel in 1885, and major-general (retired) in 1887. Appointed in 1863 to command the detachment of Royal Engineers to construct and work the line of overland telegraph connecting England with India, he was for some twenty years director of the Persian section of this important undertaking. During that period he succeeded in gaining the confidence and goodwill of the Shah and his advisers, and could also claim the friendship and regard of the several diplomatists who, apart from the British legation, looked after the interests of the respective European Powers represented at Tehran. How he and his professional colleagues overcame the difficulties originally thrown in their way by the ignorant obstruction of native officials and other causes, has long since been set forth in the published records of the India Office. One extract from the completion report addressed by the assistant director-in-chief, Colonel Champain, to the Bombay Secretariat in October, 1865, may be quoted by way of illustration: "Captain Murdoch Smith, R.E., has been, perhaps, more annoyed . . . than any other superintendent. Time after time his progress has been stopped for no reason whatever, and it often seemed that it would be impossible to complete the line. In the end, however, Captain Smith has laboured with the most untiring patience and unconquerable determination. His line is beautifully laid out and finished, and he deserves the greatest credit." Before becoming attached to the Persian telegraph in 1863, Smith had been employed in conducting excavations and researches at Halicarnassus and on the African coast, and was joint author with Captain Forbes, R.N., of an interesting and admirably illustrated volume on Cyrene. Since 1885 he had been director of the Museum of Science and Art in Edinburgh, and was employed on a special mission to Western Persia in 1887, on return from which he was made a K.C.M.G. In further acknowledgment of his public services, Sir Murdoch Smith was presented in recent years with the freedom of his native town of Kilmarnock. He was also a J.P. for Edinburgh. He did much towards the illustration of Persian art as exhibited in the South Kensington collections, and wrote a useful and instructive manual regarding it. Among the contributions which he supplied to periodical literature may be specially mentioned a short sympathetic paper on his friend and former chief, Sir John Bateman-Champain, R.E., published in the *Royal Engineer's Journal* in March, 1887, and an able statement of the advantages offered by the Karun river for penetrating into

the interior of the Shah's dominions. The latter, read in May, 1889, was justly characterized by Prof. Vambery as "full of interesting details, and perhaps the best paper hitherto published on the subject." Sir Murdoch Smith joined the Society in 1868.

Murdoch Smith was a delightful travelling-companion, as the present writer can testify from personal experience in 1865-66, when they accomplished a journey of some 800 miles together, across snow and desert, from Tehran to Sabristan. At the latter place they parted, one to find his way to the Makran coast at Charbar *viâ* Bampur, the other to reach Charbar by Bandar Abbas and the coast-line from the west. The writer has recorded that after parting from his friend he passed the night in the manger of a Perso-Baluch stable, but he is not conscious of complaint or privation on that score. What he really missed was the pleasant converse of his travelling-companion in the days preceding. That voice is now effectually hushed, but its music is not forgotten.

CORRESPONDENCE.

The Life of Calcutta as a Seaport and the Mercantile Capital of Asia.

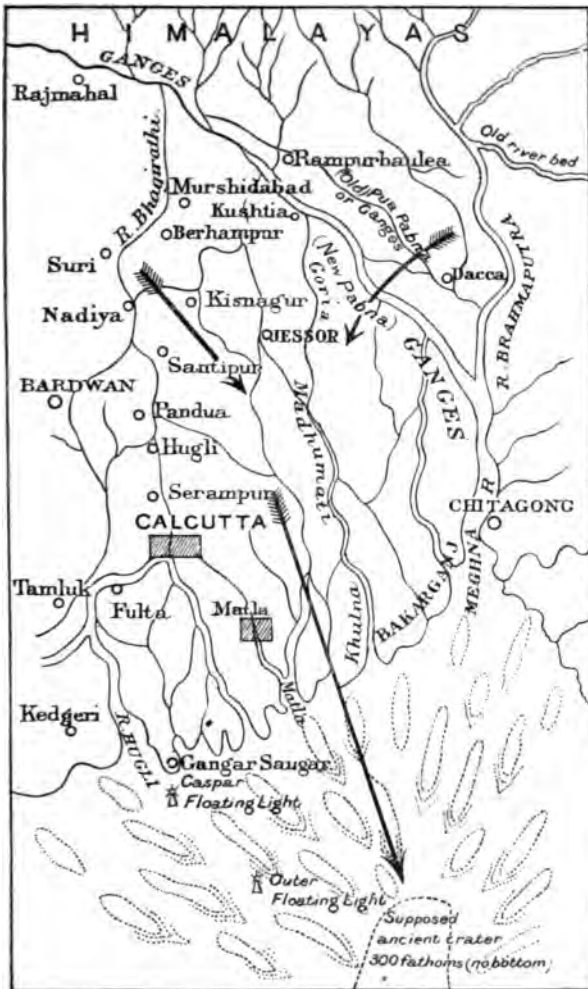
THE appearance of some interesting papers, as that of Mr. H. Benest's on river outlets and submarine formations, in our last volume of the *Geographical Journal*, reminds me of sundry geodetical and geological researches of some importance which I was led to undertake "in the young days of old" (1860-62), when Superintending Engineer of the Presidency Circle of Bengal—a district embracing Calcutta and most of the surrounding rich delta of the Ganges, or, rather, of the Hugli, Matla, Gorai, and sundry main outlets of the great river.

Fortunately, my Engineer notebook gives much reliable and original data taken down in pencil on the spot while inspecting and surveying amidst this vast network of these large and small streams or swampy *sûndarbands* of slowly moving waters. Everywhere our engineering staff were constructing roads, irrigation channels, embankments and civil and military buildings, and my attention was constantly drawn to establishing, if possible, the best substrata on which to found all ordinary foundations.

This led to a good deal of deep boring in and around Calcutta, even to a distance of 40 to 50 miles; the study of old and modern native and European maps, and especially of many ancient water-levels; the reports and correspondence of my predecessors, and of geologists and travellers—papers long buried in dusty pigeon-holes. In some of these one could occasionally detect remarks, to which, however, no importance seems to have been attached, but which, with my own investigations, showed that a vast slow geogonic movement had been ever in progress, giving to all waters a general trend much further eastward than Calcutta. This movement must, and probably within a century or two, dry up its port, and leave the Hugli a mere creek, suitable only for small native craft to at least as far south as the shallows of the much-feared "James and Mary."

The once small town and district of Hugli have, according to Indian traditions and geologists, been only peopled about one thousand years, when probably the main stream overflowed at the junction of the Bhágarathi, and so gained access eastward to Rampur Beaulah. Until then the Ganges was known to lower Bengal by its ancient local name, Bhag-irathi, and as such it fertilized all the rich plains of Berhampur, Murshidabad, and Nadiya, raising dismal swamps and lakes by rich deposits till Nadiya became "the Garden of Bengal," and its chief town the capital of lower Bengal about 1200 A.C.

An apparent rising of the Ráj-mahál hilly tracts, or sinking of the central delta some 50 to 60 miles east of Calcutta, has continued, however, to withdraw the main Gangetic stream from its old pastures, though still sending off thitherwards huge overflows as the Jalangi, Matabhanga, and many Nadiya rivers, which engineers have for half a century been labouring to keep open; for the main



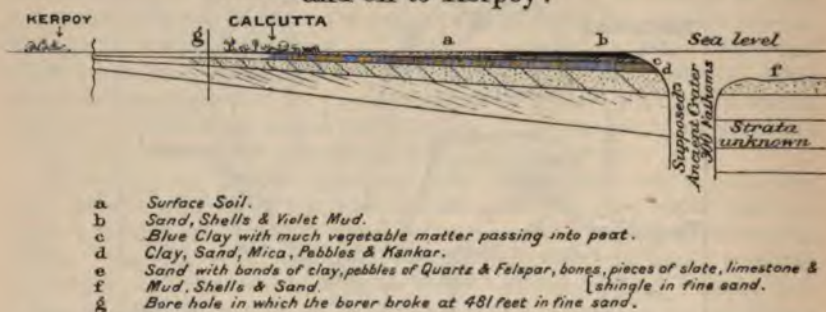
LOWER GANGES REGION.

stream presses south-east to the Kushtia-Pabna districts, where it receives a check from the higher levels in and around Dacca. At Jafarganj and Goalanda its volume is augmented by the great Brahmaputra ("child of Brahma"), here called the Jamuna; the main stream—the Ganga or Padma ("Lotus goddess"), still presses south-east, and emerges as the "Meghna channels," in the Bakarganj delta, nearly opposite Goalanda.

The lines of least resistance or of lower levels at present, however, point—as per our arrows—along the western portions of the Jessor and Khulna districts, say 50 to 60 miles east of Calcutta, and some 30 miles east of Matla, or “Port Canning,” so-called after Lord Canning, in whose reign this all-important subject attained great prominence, which would have, but for the Mutiny, ended in more than the present railroad and wharfs. The line of greatest thrust points to the mysterious abyss, some 80 miles seawards and eastward of the “Outer Floating Light,” where mariners anxiously await pilots to guide them amid the strong currents and many dangerous and ever-shifting shoals, all pointing towards the supposed crater of unknown depth and extent—unknown, at least, in the fifties and early sixties.

Of course, the sad prospective death of our beautiful capital, “the Metropolitan City of Asia,” has been long discussed by the scientific officers of various governments, but so far, the only real action taken has been 35 miles of railway to Matla. Down to the fifties large steamers used to sail from Calcutta to Allahabad, but this ceased in 1860, and, although Calcutta is 90 miles from the sea, it may be now considered the beginning of the shoals and labours of steam-dredgers. It must share the fate of Gaur, also once on the Ganges, and the capital of the delta before

Geological Section from supposed Ancient Crater to Calcutta and on to Kerpooy.



Calcutta, or Kálighát, emerged from the ocean; and Gaur too was on the bank of Káli's river, the Kála-indi, but is now known only by some fine ruins, buried in forest and long grassy swamps.

Our geological section through Calcutta to the sea will show the difficulties our Engineers have here to contend with in securing foundations for heavy buildings, such as towers, church spires, forts, etc. If too great depth is attempted, the whole bursts up like a geyser, as befel us when seeking for a solid base for the high spire of the Seáldah church in Calcutta. After excavating to 12 feet, and finding fairly strong clay and kankar for some depth below, the whole foundations were burst up by volumes of water, sand, and clays, and we had to try other devices—engineering matters our readers may not care about. On this occasion we bored down to 480 feet, when the borer gave way, and the result was still sand, kankar, pebbles, driftwood, roots, etc.; yet the engineers made good their spire, then the handsomest in Calcutta.

The Hugli, quasi ancient Ganges, was probably the western limits of the great alluvial basin, and its base is usually kankar and yellow clay, covered with modern deposits. As these accumulated, and “the sandheads” extended seawards, they threw back the waters of the Bhágirathi and Jalangi, thus silting up their channels, and in consequence, we find layers of sand and soil on the banks of these and adjacent rivers, far beyond the reach of any known existing floods.

As the Kástia-Gorai or Madhumati deepens, it must bear away the main stream of the Ganges 100 miles east of Calcutta, and, silting up all the present valuable and huge overflows, reach the sea in the wide indenture separating the districts of Khúlina and Bákarganj. This was evidently the opinion of such a high authority as Captain Shirwell, who stated that in 1856 he found the entrance of the Gorai 616 yards wide, whereas in 1838 it was only about 200 yards across.

The Ganges drains an area 26 times that of the Thames, and 5 times that of the Po; it discharges 6 times the volume of the Po, and 148 times that of the Thames; and if Adria was, as history relates, the station of the fleet of Augustus Caesar, and is now 20 miles from the sea, the Ganges delta must have advanced some hundreds of miles within the same time. Hence the certainty of the death of our great capital on the Hugli.

J. G. R. FORLONG,
Major-General.

11, Douglas Crescent, Edinburgh, June, 1900.

P.S.—Since writing my note on "The Life of Calcutta as a Sea-port," I observe the following in the *Homeward Mail* of 2nd inst., showing that the Rangoon outlet of the Irawadi is also so fast silting up as to cause anxiety to the large commercial communities inhabiting the city and neighbourhood of Rangoon:—

"The Irawadi of Burma, like the Indus at Dehra Ghazi Khan, is, according to a Rangoon paper, gradually approaching a period when it will be a terrible danger to the country. The mud swept down by the river to the plains from the hills has constantly been spreading itself over the river-bed, so that the bed has been rising year by year. This has necessitated a constant construction of embankments, continually growing higher and higher. Before very long the river-bed will be higher than the surrounding country, in which case a breach of the embankment would mean widespread disaster."

Nothing but a well-organized system of steam-dredgers, such as the energetic merchants and engineers of Glasgow have established on the Clyde estuary, can save cities situated like Calcutta, Glasgow, Rangoon, etc.

J. G. R. FORLONG.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1899-1900.

Fourteenth Ordinary Meeting, June 25, 1900.—Sir CLEMENTS MARKHAM,
K.C.B., F.R.S., President, in the Chair.

ELECTIONS.—Lieut.-Colonel Archibald Adams, I.M.S.; Herbert Apperley; Captain C. F. Beeching, 3rd R. W. Kent Regt., B.C.A. Administration; Colonel Sir William S. S. Bissett, R.E., K.C.I.E.; Egerton Brydges; Charles Edward Campbell; Joseph Cross; Captain Metcalfe Dale, Lincoln Regiment; Captain Austen James Digan, D.S.O.; Rear-Admiral Charles Drury; William H. George; Major A. C. MacDonnell, R.E.; Arthur Mallalieu; H. P. Fitz-Gerald Marriott; Colonel Wm. James Massy, late 1st Batt. Norfolk Regiment; Kōzui Otani, Fellow of the Tokio Geographical Society; Harold G. Parsons; Lieut. Robert F. Scott, R.N.; Percy Arthur Silburn; Mark Aurel Stein, Ph.D.; Captain Cosmo Gordon Stewart, R.A.

The Paper read was:—

"Results of the Sir George Newnes Antarctic Expedition." By C. E. Borchgrevink.

GEOGRAPHICAL LITERATURE OF THE MONTH.

*Additions to the Library.*By HUGH ROBERT MILL, D.Sc., LL.D., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Abh. = Abhandlungen.	Mem. = Memoirs, Mémoires.
Ann. = Annals, Annales, Annalen.	Met. = Meteorological.
B. = Bulletin, Bollettino, Boletim.	P. = Proceedings.
Com. = Commerce.	R. = Royal.
C. Rd. = Comptes Rendus.	Rev. = Review, Revue.
Erdk. = Erdkunde.	S. = Society, Société, Selskab.
G. = Geography, Geographie, Geografia.	Sitzb. = Sitzungsbericht.
Ges. = Gesellschaft.	T. = Transactions.
I. = Institute, Institution.	V. = Verein.
Iz. = Izvestiya.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
k. u. k. = kaiserlich und königlich.	Z. = Zeitschrift.
M. = Mitteilungen.	Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

- Alps.** Forbes.
 Travels through the Alps. By the late James D. Forbes, F.R.S. New edition, revised and annotated by W. A. B. Coolidge. London: A. & C. Black, 1900. Size 9½ × 6½, pp. xxxviii. and 572. *Portrait, Maps, and Illustrations.* Price 20s. *net.* Presented by the Publishers.

A collection of several works of the late Principal J. D. Forbes, describing his early travels through the Alps, where he was the pioneer of British climbers. A preface explains the manner in which the original books and memoirs have been modified in this edition, and the editor also adds an introduction, some preliminary matter, and a complex of footnotes explanatory, critical, and supplemental.

- Austria—Languages.** Gonzaga.
 La Questione delle Lingue in Austria. Rapporto del conte Carlo Valenti Arrivabene Gonzaga.—Bollettino del Ministero degli affari Esteri. May, 1900. Roma, 1900. Size 9½ × 6½, pp. 10.

A classification of the linguistic composition of the population of the various provinces of Austria.

- Austria—Tirol.** *Z. Deutsch. u. Österreich. Alpenv.* 30 (1899): 43–57. Alton.
 Enneberg in seinen wirthschaftlichen und socialen Verhältnissen. Von Dr. Johaun Alton.

Enneberg is a branch valley of the Gader Thal, which enters the Puster Thal from the south. The economic and social life of the people is the subject of this paper.

Denmark—Copenhagen.

Copenhagen, the Capital of Denmark, published by the Danish Tourist Society. Copenhagen, 1898. Size 9 × 6½, pp. 112. *Map and Illustrations.* Presented by the Danish Tourist Society.

A well-illustrated guide-book to Copenhagen.

- Eastern Alps.** *Z. Deutsch. u. Österreich. Alpenv.* 30 (1899): 1–17. Ranke.
 Erinnerung an die vorgeschichtlichen Bewohner der Ostalpen. Von Johannes Ranke. *With Illustrations.*

On the remains of primæval man in the valleys of the Eastern Alps.

- Europe—Population.** *B.S.G. Italiana* 1 (1900): 94–102, 185–197, 281–306. Pasanisi.
 La popolazione dell' Europa. Nota del dott. Fr. M. Pasanisi.

- France.** *Mém. S. Spéléologie* 3 (20) (1899): 1-34. **Martel.**
L'Aven Armand, les Grottes de Ganges, les Gouffres de Sauve. Par E.-A. Martel.
With Plans and Illustrations.
- France—Bordeaux.** *B.S.G. Com. Bordeaux* 26 (1900): 129-136. **Foncin.**
Bordeaux et l'esprit Colonial. Par M. P. Foncin.
- France—Bordeaux District.** **Hearn.**
Trade of Bordeaux and district for the year 1899. Foreign Office, Annual No. 2415, 1900. Size 10 x 6, pp. 58. *Price* 3d.
— This is a remarkably full and interesting report, one of the few which could be recommended to any teacher or student of commercial geography as a model specimen of the study of the economic conditions of a considerable region.
- France—Corsica.** **Holmes.**
Trade of Corsica for the year 1899. Foreign Office, Annual No. 2418, 1900. Size 10 x 6, pp. 12. *Price* 1d.
- France—Ille-et-Vilaine.** *C. Rd.* 130 (1900): 1163-1166. **Lechartrie.**
Cartes agronomiques du canton de Redon. De la composition des terres au point de vue de la chaux, de la magnésie, de la potasse et de l'azote. Note de M. G. Lechartier.
- France—Lorraine.** *C. Rd.* 130 (1900): 598-600. **Bleicher.**
Sur la dénudation de l'ensemble du plateau lorrain et sur quelques-unes de ses conséquences. Note de M. Bleicher.
- Germany.** **Gastrell.**
Economic Position of the German Empire in 1900. Foreign Office, Annual No. 2400, 1900. Size 10 x 6½, pp. 44. *Price* 2½d.
A comprehensive report on the economic progress and present resources of the German Empire, with elaborate statistical appendices of imperial revenue and expenditure from 1872 to 1900.
- Germany—Hesse.** **Bergmann.**
Die Volksdichte der Grossherzoglich Hessischen Provinz Starkenburg auf Grund der Volkszählung vom 2. Dezember 1895. Von Dr. Karl Bergmann.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Zwölfter Band. Heft 4. Stuttgart: J. Engelhorn, 1900. Size 9½ x 6½, pp. 297-364. *Map. Price* 5.70 m.
- Germany—Prussia.** **Bernal.**
Trade of Pomerania for the year 1899. Foreign Office, Annual No. 2403, 1900. Size 10 x 6, pp. 64. *Price* 3d.
It is mentioned in this report that the use of ice-breakers has been so successful at Stettin as to make the port now practically an open one all the year round, except in those rare winters when the western Baltic is blocked with ice.
- Germany—Prussia.** *Sitzb. A. W. Berlin* (19) (1900): 303-316. **Schuchhardt.**
Das Römercastell bei Haltern an der Lippe. Von Dr. C. Schuchhardt. *With Plan.*
- Germany—Prussia.** **Fox.**
Die Pässe der Sudeten unter besonderer Berücksichtigung der Zentralsudeten. Von Dr. Robert Fox.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. xiii. Band, Heft 1. Stuttgart: J. Engelhorn, 1900. Size 9½ x 6½, pp. 88. *Map. Price* 5.20 m.
- Germany—Prussia.** *Globus* 77 (1900): 201-207, 220-224. **Tetzner.**
Die Polaben im hannöverschen Wendland. Von Dr. F. Tetzner. *With Sketch-map and Illustrations.*
- Germany—Thuringia.** *M.G. Ges. Jena* 18 (1900): 52-96. **Berg.**
Literaturbericht zur Landes- und Volkskunde Thüringens. Bearbeitet von Alfred Berg.
This bibliography contains 240 titles of books and papers on Thuringia published between 1894 and 1899 inclusive.
- Germany—Thuringia.** *M.G. Ges. Jena* 18 (1900): 32-51. **Wiesel.**
Das Sornitzgebiet, physisch-geographische Skizze. Von C. Wiesel.
This is a small area of the Frankenwald belonging politically to the little states of Schwarzburg-Rudolstadt, Sachsen-Meiningen and the two principalities of Reuss.

Germany—Württemberg.

Württembergisches Urkundenbuch. Herausgegeben von dem Königlichen Staatsarchiv in Stuttgart mit Unterstützung der Kommission für Landesgeschichte. Siebenter Band. Stuttgart, 1900. Size 13×10 , pp. xxxii. and 554. *Presented by the K. Universitätsbibliothek, Tübingen.*

The archives of Württemberg for 1269–1276 are reproduced in this volume in their original Latin.

Greece. *B. American G.S.* 32 (1900): 151–157. **Young.**
 Peloponnesian Journeys. By Clarence H. Young.

Greece—Cyclades. **Cottrell.**
 Trade of the Cyclades for the year 1899. Foreign Office, Annual No. 2411, 1900. Size $10 \times 6\frac{1}{2}$, pp. 14. *Price 1d.*

Greece—Piræus. **Walsh.**
 Trade and Agriculture of the Piræus for the year 1899. Foreign Office, Annual No. 2410, 1900. Size $10 \times 6\frac{1}{2}$, pp. 16. *Price 1d.*

Greece—Thessaly. **Merlin.**
 Trade and Agriculture of Thessaly for the year 1899. Foreign Office, Annual No. 2385, 1900. Size $10 \times 6\frac{1}{2}$, pp. 16. *Price 1d.*

This report gives the new territorial division of the province of Thessaly into four prefectures.

Iceland. **Bruun.**
 Arkæologiske Undersøgelser paa Island foretagne i Sommeren 1898. Af Daniel Bruun [København], Ernst Bojesen, [1899]. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 48. *Illustrations. Presented by the Publisher.*

Iceland. *Aarb. Nord. Old. Historie* 14 (1899): 273–316. **Hammerich.**
 Studier over islandsk Musik. Af Angul Hammerich.

Iceland. *Scottish G. Mag.* 16 (1900): 265–293. **Pjetursson.**
 The Glacial Palagonite-Formation of Iceland. By Helgi Pjetursson.

Italy. **Benham.**
 Trade of Italy for the years 1898 and 1899. Foreign Office, Annual No. 2390, 1900. Size 10×6 , pp. 60. *Diagrams. Price 8½d.*

This report contains a number of statistical diagrams showing the trade of Italy in a graphic form.

Italy. **Neville-Rolfe.**
 Trade of Southern Italy for the year 1899. Foreign Office, Annual No. 2376, 1900. Size $9\frac{1}{2} \times 6$, pp. 26. *Price 2d.*

This report mentions the discovery of valuable deposits of guano in some islands of the Red Sea in the Italian possessions.

Italy—Leghorn and Ancona. **Carmichael and Tomassini.**
 Trade of Leghorn and Ancona for the year 1899. Foreign Office, Annual No. 2417, 1900. Size 10×6 , pp. 26. *Price 2d.*

Italy—Lombardy. **Armstrong.**
 Trade of Lombardy for the year 1899. Foreign Office, Annual No. 2413, 1900. Size 10×6 , pp. 12. *Price 1d.*

Hailstorms do much damage to the silk industry in Lombardy by destroying the mulberry trees, and experiments which have been instituted to avert hailstorms by firing specially constructed cannon at the clouds are stated to have had a certain amount of success.

Italy—Pantellaria. *Globus* 77 (1900): 137–143. **Mayr.**
 Pantelleria. Von Dr. Albert Mayr. *With Map and Illustrations.*

Italy—Venice. **Zuccato.**
 Trade of Venice for the years 1898–99. Foreign Office, Annual No. 2380, 1900. Size 10×6 , pp. 26. *Price 2d.*

The Peninsular and Oriental Company are discontinuing their steamer service from Venice to Brindisi and Port Said.

Jura Mountains. *Mém. S. Spéléologie* 3 (21) (1899): 1–72. **Fournier and Magnin.**
 Recherches spéléologiques dans la chaîne du Jura. Par Mm. Fournier et Magnin. *With Plans.*

Mediterranean Region. *La G., B.S.G. Paris* (1900): 261-266. **Bonnier.**

Remarques sur les variations des limites de la région méditerranéenne. Par M. Gaston Bonnier.

On the Mediterranean region as marked by vegetation.

Portugal.

Harrison.

Trade of Portugal for the years 1897 and 1898. Foreign Office, Annual No. 2378, 1900. Size 10 x 6½, pp. 54. Price 3d.

Rumania—Population.

Mouvement de la population de la Roumanie en 1894. Precedată de o Introducțiune cu date retrospective de Leonida Colescu. Bucuresti, 1900. Size 12½ x 9½, pp. 6, liv., and 56.

Russia—Coal.

Cooke.

Coal Crisis in Russia. Foreign Office, Miscellaneous, No. 523, 1900. Size 10 x 6½, pp. 8. Price ½d.

A summary of the Russian coal-supply from native sources.

Russia—Finland. *Meddelanden G. Fören. Finland* 5 (1899-1900): 1-64. **Boldt.**

Ortbeskrifningen i Finland på 16—och 1700—talen. Anteckningar af R. Boldt.

Description from contemporary manuscripts of the districts of Finland in the sixteenth and seventeenth centuries.

Russia—Finland. *Meddelanden G. Fören. Finland* 5 (1899-1900), (7): 1-42. **Joutsen.**

Rakennustyyppejä Reaki-Suomen pohjoisosasta. Koonnut O. A. Joutsen. *With Illustrations.*

On the different types of dwellings in Central Finland.

Russia—Finland. *Meddelanden G. Fören. Finland* 5 (1899-1900) (5): 1-50. **Olsson.**

En Trapa-förande torfmossa på Åland. Af P. Hj. Olsson. *With Map.*

On the post-Tertiary flora of the little marshy lake Långträsk in the parish of Hammarland, in Åland.

Russia—Odessa.

Mackie.

Agriculture and Trade (Supplementary) of Odessa and District for the year 1898.

Foreign Office, Annual No. 2366, 1899. Size 10 x 6, pp. 42. Price 2½d.

Russian Empire—Population.

Premier Recensement Général de la Population de l'Empire de Russie, 1897.

Publication du Comité Central de Statistique, sous la rédaction de N. Troinitsky.

i. Gouvernement d'Arkhangel, cahier i. (pp. 46); xxvii. Gouvernement d'Olonets, cahier i. (pp. 36); lxxii. Province de l'Amour, cahier i. (pp. 14); lxxvi. Province

Primorskaia (du Littoral), cahier i. (pp. 44); lxxvii. Ile de Sakhaline, cahier i.

(pp. 16). 1899. Size 11½ x 9. *Maps. Presented by the Comité Central de*

Statistique, Russia.

Servia.

Macdonald.

Trade of Servia for the years 1898-99. Foreign Office, Annual No. 2383, 1900.

Size 9½ x 6, pp. 18. Price 1½d.

The Servian Government has recently granted concessions for the construction of a number of light railways, designed to open up the country.

Servia.

Globus 77 (1900): 265-269.

Weigand.

Die Rumänen in Serbien. Von Prof. Gustav Weigand.

On the languages of Servia, with a list of Rumanian place-names in that country.

Spain—Asturias.

Jones.

The Devonian Iron Ores of Asturias, Spain. A paper read before the Institution

of Mining Engineers. By J. A. Jones. Annual General Meeting at Sheffield,

September 19, 1899. Excerpt from the Transactions of the Institution of Mining

Engineers. London and Newcastle-upon-Tyne: A. Reid & Co., 1899. Size

10 x 6½, pp. 14. *Map and Plans. Presented by the Secretary of the Institution.*

Spain—Galicia.

Talbot.

Trade of Corunna and District for the year 1899. Foreign Office, Annual

No. 2407, 1900. Size 10 x 6, pp. 38. Price 2½d.

Spain—Malaga.

Finn.

Trade of Malaga and District for the year 1899. Foreign Office, Annual

No. 2420, 1900. Size 10 x 6, pp. 58. Price 3d.

Sweden Lakes. *Ymer* 20 (1900): 88-101. **Nerman.**

Studier öfver vattenförhållandena i svenska sjöar. Af Gustaf Nerman.

On the water-level, evaporation, and other conditions of some of the Swedish lakes.

Sweden—Plant Geography. **Kindberg.**

Öfversigt K. Vet. A. Förhand. Stockholm 56 (1899): 1003-1011.

Nya bidrag till Vermlands och Dals bryogeografi. Af N. Conr. Kindberg.

Sweden—Stockholm. **MacGregor.**

Trade of Stockholm and Eastern Coast of Sweden for the year 1899. Foreign Office, Annual No. 2401, 1900. Size $10 \times 6\frac{1}{2}$, pp. 40. Price 2½d.

This report contains statistics of the wood and iron production of Sweden for several years.

Switzerland. **Sartorius.**

Die Germanisierung der Rätomanen in der Schweiz. Volkswirtschaftliche und nationalpolitische Studien. Von A. Sartorius Freiherrn v. Waltershausen.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Zwölfter Band, Heft 5. Stuttgart: J. Engelhorn, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 369-474. Map. Price 5.20 m.

Turkey—Macedonia. **Cvijić.**

Die Macedonischen Seen. Ein vorläufiger Bericht von Prof. J. Cvijić. (Sonderabdruck aus dem "Abrégé" der Mittheilungen der Ung. Geogr. Gesellschaft, Band xxviii. 1900.) Budapest, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 16. Presented by the Author.

On some of the lakes of Macedonia and Albania, with sketch-maps.

United Kingdom.

Mines and Quarries: General Report and Statistics for 1899. Part I.—District Statistics. Statistics of the persons employed, output, and accidents at Mines and Quarries in the United Kingdom, arranged according to the Inspection Districts. London: Eyre & Spottiswoode, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 46. Maps. Price 8d. Presented by the Home Office.

In 1899 the total output of coal for the United Kingdom was 220,094,781 tons.

United Kingdom—England. **Baxendell.**

Borough of Southport. Meteorological Department. The Fernley Observatory, Southport. Report and Results of Observations for the year 1899. By Joseph Baxendell. Southport, 1900. Size $10 \times 7\frac{1}{2}$, pp. 28. Diagram.

United Kingdom—England. **Calvert.**

Yorkshire Ramblers' Club J. (1899-1900): 65-74, 123-133.

Gaping Ghyll Hole. By Edward Calvert. With Plans, Sections, and Illustrations.

Description of the exploration of Gaping Ghyll, with some striking pictures of stalactites.

United Kingdom—England. *Yorkshire Ramblers' Club J.* 1 (1900): 114-122. **Ellet.**

Long Kin Hole (West). By Frank Ellet. With Plans and Sections.

Describes the descent of this cavern, first to a landing at 70 feet, then a further descent of 160 feet to a second landing, below which there was a further drop of 90 feet.

United Kingdom—England. **Mill.**

A Fragment of the Geography of England. South-West Sussex. By Hugh Robert Mill, D.Sc., LL.D. (From the *Geographical Journal* for March and April, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 52. Maps, Plans, and Illustrations.

A critical note by Prof. W. M. Davis appears in *Science* 11 (1900), 870-871.

United Kingdom—Meteorology.

Meteorological Observations at Stations of the Second Order for the year 1896.

London: Eyre & Spottiswoode, 1899. Size $12\frac{1}{2} \times 10$, pp. 186. Map. Price 21s.

Presented by the Meteorological Office.

United Kingdom—Scotland. **Murray and Pullar.**

A Bathymetrical Survey of the Fresh-water Lochs of Scotland. By Sir John Murray, K.C.B., and Fred. P. Pullar. (From the *Geographical Journal* for April, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 44. Maps and Illustrations.

ASIA.

Afghanistan. *Imp. and Asiatic Quarterly Rev.* 10 (1900): 25-36. **Colquhoun.**

Afghanistan: the key to India. By Archibald R. Colquhoun.

- Armenia—Ararat.** *Z. Deutsch. u. Österreich-Alpenv.* 30 (1899): 144-163. **Ebeling.**
Der Ararat. Von Max Ebeling. *With Illustrations.*
This description of Ararat includes the account of an ascent in September, 1897.
- Asia—Winds.** *Meteorolog. Z.* 17 (1900): 202-207. **Woeikof.**
Der Luftdruck und die atmosphärische Cirkulation in Asien. Von A. Woeikof.
- Central Asia.** *La G., B.S.G. Paris* (1900): 461-464. **Deniker.**
Résultats scientifiques du voyage de MM. Roborovsky et Kozlov en Asie centrale.
Par J. Deniker.
- China.** *J. China Br. R. Asiatic S.* 31 (1896-97): 102-115. **Carles.**
The Grand Canal of China. By W. R. Carles.
This is the complete paper contributed by Mr. Carles to the China Branch of the Royal Asiatic Society in 1895, which had been lost and an imperfect summary published in its place.
- China.** *La G., B.S.G. Paris* (1900): 449-460. **Vaulserre.**
Le Fleuve Bleu de Sui-fou à la hauteur de Tali-fou. Par le Vicomte de Vaulserre.
With Map and Illustrations.
- China—Foochow.** **Playfair.**
Trade of Foochow for the year 1899. Foreign Office, Annual No. 2434, 1900.
Size 10 × 6½, pp. 12. *Price 1d.*
- China—Ichang.** **Wilton.**
Trade of Ichang for the year 1899. Foreign Office, Annual No. 2429, 1900. Size
10 × 6, pp. 8. *Price ½d.*
- China—Mongolia.** *J. China Br. R. Asiatic S.* 31 (1896-97): 1-39. **Parker.**
Inscriptions de l'Orkhon, Déchiffrées par Vilh. Thomsen. By E. H. Parker.
A criticism of Prof. Thomsen's interpretation of the Orkhon inscription.
- China—San-tu-ao.** *La G., B.S.G. Paris* (1900): 385-388. **Fauvel.**
Le nouveau port de San-tou-ao. Par M. A. A. Fauvel. *With Map.*
- China—Tibet.** **Strachey.**
Narrative of a Journey to the Lakes Rakas-tal and Manasarowar, in Western Tibet,
undertaken in September, 1848. By Lieut.-General Sir Richard Strachey, R.E.,
G.C.S.I., F.R.S. (From the *Geographical Journal* for February, March, and April,
1900.) Size 10 × 6½, pp. 62. *Map and Illustrations.*
- China—Wuchow.** **Hausser.**
Trade of Wuchow for the year 1899. Foreign Office, Annual No. 2432. 1900.
Size 9½ × 6, pp. 18. *Price 1½d.*
- China—Yangtze.** *T. Liverpool G.S.* (1899): 15-20. **Little.**
The Yangtze Valley and the British Sphere. By Archibald J. Little.
- India—Brahmaputra.** *P. Asiatic S. Bengal* (1899): 114-116. **Waddell.**
The Physical Types and Affinities of the Wild Tribes of the Brahmaputra Valley.
By Major L. A. Waddell, LL.D. (Abstract.)
- India—Irrigation.** *Petermanns M.* 46 (1900): 34-40, 58-61. **Jung.**
Das Bewässerungssystem in Britisch-Indien. Von Dr. Carl E. Jung.
- India—Madras.**
Report on the Administration of the Madras Presidency during the year 1898-99.
Madras, 1899. Size 13½ × 8½, pp. xvi., 272, and ccxii. *Maps and Diagrams.*
- India—Madras—Anthropology.**
Notes on Some of the People of Malabar; Mala Védars of Travancore; Miscellanea.
(Madras Government Museum. *Bulletin*, vol. iii. No. 1.—Anthropology.) Madras,
1900. Size 8½ × 5½, pp. 92. *Plates. Presented by the Museum.*
- India—North-West Frontier.** *J.R. United Service I.* 44 (1900): 223-247. **Yate.**
Sixty Years of Frontier Warfare. By Major A. C. Yate. *With Plates.*
Major Yate shows that the tactics of the Pathans in warfare have remained un-
changed for many years.
- Indian Ocean—Seychelles.** *La G., B.S.G. Paris* (1900): 289-308. **Fauvel.**
La Découverte des îles Seychelles d'après des Documents inédits. Par M. A. A.
Fauvel. *With Maps.*

Part of the hitherto unpublished log of two small French vessels sent out to Mauritius to survey the neighbouring islands in 1742, and giving particulars of the discovery of the Seychelles.

Indo-China.

Pavie—Cupet.

Mission Pavie Indo-Chine, 1879-1895. *Géographie et Voyages*, III. Voyages au Laos et chez les Sauvages du sud-est de l'Indo-Chine. Par le Capitaine Cupet. Introduction par Auguste Pavie. Paris: E. Leroux, 1900. Size $11\frac{1}{2} \times 9$, pp. 428. *Maps and Illustrations*. Price 8s. 6d.

Japan.

Hall.

Trade of Hiogo and Osaka for the year 1898. Foreign Office, Annual No. 2379, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 20. Price $1\frac{1}{2}$ d.

Korea.

National G. Mag. 11 (1900): 145-155.

Webster.

Korea—the Hermit Nation. By Commander H. Webster. *With Illustrations*.

A short description from personal observation.

Malay Archipelago—Sumatra.

Globe 77 (1900): 254-257.

Die Tabakkultur in Sumatra. *With Illustrations*.

Illustrations of the preparation of ground for a plantation, and the cultivation of tobacco.

Persia.

J.E. India Assoc. 31 (1900): 5-21.

Griffin.

Persia. By Sir Lepel Griffin, K.C.S.I.

On the present condition of Persia, and the prospect of its economic development.

Persia—Khorassan.

Whyte.

Trade of Khorassan for the year 1898-99. Foreign Office, Annual No. 2368, 1899.

Size $10 \times 6\frac{1}{2}$, pp. 16. Price 1d.

Persia—Teheran.

Petermanns M. 46 (1900): 49-57.

Stahl.

Teheran und Umgegend. Von A. F. Stahl. *With Map*.

Philippine Islands.

Doyle.

Observatorio de Manila. Tifones del Archipiélago Filipino y mares circunvecinos 1895 y 1896. Estudio de los mismos por el P. Juan Doyle, S.J. Manila, 1899.

Size $12\frac{1}{2} \times 9$, pp. 110. *Diagrams*. Presented by the Observatory.

Philippine Islands.

B. American G.S. 32 (1900): 133-150.

Schurman.

The Philippine Islands and their People. By J. G. Schurman.

Russia—Armenia.

Friederichsen.

Russisch Armenien und der Ararat. Von Dr. Max Friederichsen. (Separatabdruck aus den Mittheilungen der Geographischen Gesellschaft in Hamburg, Bd. xvi., 1900.) Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 16. *Map and Plate*.

Russia—Siberia.

Deutsche Rundschau G. 22 (1900): 212-223, 266-272.

Stenin.

Die Natur des Gebietes Jakutsk. Von Peter v. Stenin. *With Illustrations*.

Russian Central Asia.

J.S. Arts 48 (1900): 554-568.

Colquhoun.

Russian Central Asia: Countries and Peoples. By Archibald R. Colquhoun. *With Map*.

Russian Central Asia.

T. Liverpool G.S. (1899): 37-43.

Rickmers.

A Journey through the Khanate of Bokhara. By Mrs. Rickmer Rickmers.

Russian Turkestan.

Vénukoff.

M. Vénukoff. De l'état actuel (1899) du Turkestan Russe. (In Russian.) Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. [14.] Presented by the Author.

Turkey.

Cuinet.

La Turquie d'Asie. Géographie administrative, statistique, descriptive et raisonnée de chaque Province de l'Asie-Mineure. Par Vital Cuinet. Table alphabétique. Paris: E. Leroux, 1900. Size $11 \times 7\frac{1}{2}$, pp. 48.

The index to Cuinet's great work on Asiatic Turkey.

Turkey—Anatolia.

Deutsche Rundschau G. 22 (1900): 241-247, 300-309.

Struck.

Durch Pontus nach Amassia. Von Ad. Struck. *With Illustrations*.

Turkey—Anatolia.

Longworth.

Trade of the Vilayets of Trebizond and Sivas for the year 1899. Foreign Office, Annual No. 2396, 1900. Size 10×6 , pp. 20. Price $1\frac{1}{2}$ d.

Turkey—Palestine.**Dickson.**

Trade of Palestine for the year 1899. Foreign Office, Annual No. 2405, 1900.
Size 10 x 6, pp. 10. Price 1d.

AFRICA.

Africa—Meteorology. *Brit. Assoc. Rep.* (1899): 448-459.

The Climatology of Africa. Eighth Report of a Committee.

This is referred to in the *Geographical Journal*, vol. xiv. (1899), p. 547.

Algeria—Algiers.**Hyam.**

The Illustrated Guide to Algiers. A "Practical" Handbook for Travellers. By Joseph C. Hyam. First Edition. Algiers: the Anglo-French Press Association, 1899. Size 8½ x 5½, pp. xii. and 228. *Maps and Illustrations. Presented by the Author.*

This guide-book is the work of a resident in Algiers. Many of the illustrations are of interest.

British East Africa. *Church Miss. Intelligencer* 51 (1900): 496-508.

Tucker.

A Missionary Journey through Nkole. By Bishop Tucker.

Nkole is a district to the south-west of Koki, bordering the German territory of Karagwe, and this article describes a pioneer missionary expedition.

British East Africa—Mount Kenya. *Q.J. Geol. S.* 56 (1900): 205-222.

Gregory.

The Geology of Mount Kenya. By Prof. J. W. Gregory, D.Sc. *With Map, Plates, and Sections.*

Dr. Gregory summarizes his conclusions thus: (1) Mount Kenya is an ancient, much-eroded volcano; the highest peak is formed of the rocks of the central plug; the site of the crater-walls is marked by the agglomerates, ashes, and tuffs of the Alpine zone. (2) The main lava series is formed of kenytes, rocks allied to pass-tellerites, but of a somewhat more basic type. (3) The lowest exposure of the central core is an olivine-bearing nepheline syenite. (4) The lava-sequence is: firstly, phonolite; secondly, kenytes; and finally, olivine-basalts.

British East Africa—Mount Kenya. *Alpine J.* 20 (1900): 102-110.

Mackinder.

The Ascent of Mount Kenya. By H. J. Mackinder. *With Illustrations.*

British Somali Coast.**Sadler.**

Trade of the Somali Coast for the year 1898-99. Foreign Office, Annual No. 2384, 1900. Size 9½ x 6, pp. 40. Price 2½d.

British South Africa.**Baden-Powell.**

The Matabele Campaign, 1896. Being a Narrative of the Campaign in suppressing the Native Rising in Matabeleland and Mashonaland. By Colonel R. S. S. Baden-Powell. London: Methuen & Co., 1900. Size 9 x 6, pp. 144. *Illustrations.* Price 6d.

A cheap edition.

Central Africa.

Mouvement G. 17 (1900): 183-186.

Lemaire.

L'expédition Lemaire aux sources du Congo, du Kasai et du Zambèse. *With Map.*

Central Africa—Katanga.**Delcommune.**

Mouvement G. 17 (1900): 145-148, 160-162, 181-184.

Au Katanga: la traversée des monts Kibala.

Central Africa—Universities' Mission.

Report of the Universities' Mission to Central Africa. 1899. London: Office of the Mission. Size 7½ x 5, pp. 136. *Illustrations.* Price 3d. *Presented by the Mission.*

Congo State.**Poskin.**

Bilans Congolais. Étude sur la valeur commerciale du Congo par rapport à la Belgique. Par Alphonse Poskin. Bruxelles: O. Schepens & C^e, 1900. Size 9½ x 6, pp. 84. *Presented by the Author.*

Egypt—Alexandria.

B.S. Khediv. G. 5 (1900): 329-354.

Kyrillos II

Le temple du Césaréum et l'Église patriarcale d'Alexandrie. Par S. B. Monseigneur Kyrillos II.

- Egypt—Archæology.** Forbes.
On a collection of Stone Implements in the Mayer Museum, made by Mr. H. W. Seton-Karr, in Mines of the Ancient Egyptians discovered by him on the plateaux of the Nile Valley. By Henry O. Forbes, LL.D. (Reprinted from *Bull. Liverpool Mus.*, ii., Nos. 3 and 4 (January 24, 1900). Size $10\frac{1}{2} \times 6\frac{1}{2}$, pp. 77-115. *Map and Illustrations. Presented by the Author.*
- Egypt—Sand-dunes.** Cornish.
On Desert Sand-dunes bordering the Nile Delta. By Vaughan Cornish, M.Sc. (From the *Geographical Journal* for January, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 32. *Maps and Illustrations.*
- French Congo.** Fourneau.
Renseignements Colon., Comité l'Afrique Française No. 1 (1900): 19-21.
La mission Fourneau. *With Map.*
- French Congo.** Mouvement G. 17 (1900): 133-141. Wauters.
Le problème du Wam. Par A.-J. Wauters. *With Maps.*
The Wam is shown as the source of the western branch of the Ubangi.
- French Guinea.** Rev. *Scientifique* 13 (1900): 399-401. Leprince.
Les Simons, sorciers de la Guinée française. Par M. Jules Leprince.
- French Guinea.** B.S.G. Com. Paris 21 (1899): 501-519. Maclaud.
La Guinée française, étude et souvenirs. Par M. le Docteur Maclaud. *With Map.*
- French Sudan.** Bastard.
A travers le Monde, Tour du Monde 6 (1900): 129-132, 137-140.
Une Ville du Niger: Dienné. Par M. G. Bastard. *With Illustrations.*
- French Sudan.** Questions Dipl. et Colon. 9 (1900): 399-411, 459-474. Lorin.
Le Soudan français. Par M. H. Lorin. *With Map.*
Description of the character of the French Sudan, and the history of its occupation.
- French Sudan.** La G., B.S.G. Paris (1900): 177-192. Prins.
Vers le Tchad. Une année de résidence auprès de Mohamed Abd-er-Rhaman Gaourang Sultan de Baguirmi. Avril 1898—Mai 1899. Par M. Pierre Prins.
- French Sudan.** La G., B.S.G. Paris (1900): 193-196. Prins.
Voyage au Dar Rounga. Par M. Pierre Prins. *With Map.*
- French West Africa.** Mouvement G. 17 (1900): 85-88, 109-113. Wauters.
La région des concessions dans le bassin de la Sanga. Par A.-J. Wauters. *With Map.*
- French West Africa—Sanga.** Mouvement G. 17 (1900): 121-124. Wauters.
La Sanga. Par A. J. Wauters.
- German East Africa.** M. Deutsch. Schutzgeb. 13 (1900): 18-39. —
Die Fortschritte der Pendel expedition.
- German East Africa.** M. Deutsch. Schutzgeb. 13 (1900): 45-60. Baumstark.
Die Warangi. Von Leutnant Baumstark.
- German East Africa.** M. Deutsch. Schutzgeb. 13 (1900): 39-44. Dantz.
Ergebnisse der geologischen Expedition des Bergassessors Dr. Dantz.
- German East Africa.** Sitzb. A.W. Berlin (16) (1900): 191-211. Engler.
Über die Vegetationsverhältnisse des Ulugurugebirges in Deutsch-Ostafrika. Zum Theil Ergebniss der Nyassasee- und Kingagebirgs-Expedition der Hermann und Elise geb. Heckmann Wentzel-Stiftung. Von A. Engler.
- German East Africa.** M. Deutsch. Schutzgeb. 13 (1900): 61-75. Richter.
Einige weitere ethnographische Notizen über den Bezirk Bukoba. Von Hauptmann Richter.
- German East Africa.** Globus 77 (1900): 186-191, 236-240, 269-272. Seidel.
Photographien aus Deutsch-Ostafrika. Erläutert von H. Seidel. *With Illustrations.*
- German South-West Africa.** Globus 77 (1900): 227-229. Gessert.
Das Land zwischen Inachab und Bethanien. Deutsch-Südwest-Afrika in seiner wirtschaftlichen Bedeutung. Von Ferdinand Gessert.

- German South-West Africa.** *Petermanns M.* 46 (1900): 18-19. Langhans.
 Buren in Deutsch-Südwest-Afrika. Von Paul Langhans. *With Map.*
 On the number of Boers in German South-West Africa.
- German West Africa.** *M. Deutsch. Schutzgeb.* 13 (1900): 1-3. Gessert.
 Zur Harmattan-Frage. Von Ferdinand Gessert.
- German West Africa—Kamerun.** *Petermanns M.* 46 (1900): 21. Matzat.
 Regenmessungen aus Kamerun. Von H. Matzat.
- German West Africa—Togo.** *Globus* 77 (1900): 281-285, 305-307. Hupfeld.
 Die Erschliessung des Kaburelandes in Nordtogo. Von Fr. Hupfeld. *With Sketch-map.*
- Ivory Coast.** *Tour du Monde* 6 (1900): 73-108. Eysséric.
 Exploration et Captivité chez les Gouros. Par M. J. Eysséric. *With Map and Illustrations.*
- Madagascar.** *B.S.G. Com. Paris* 21 (1899): 461-485. Coudray.
 Madagascar au point de vue économique. Par M. Lallier du Coudray.
 The author of this paper is "Director of Civil Affairs" in Madagascar.
- Madagascar—Railway.** *Renseignements Colon., Comité l'Afrique Française* No. 1 (1900): 15-18.
 Les travaux publics et le chemin de fer de Madagascar. *With Map.*
 On the projected railway between Tamatave and Antananarivo.
- Nigeria—Yoruba.** *Church Miss. Intelligencer* 51 (1900): 362-368, 443-449. Harding.
 In Yorubaland. Journal of the Rev. T. Harding.
- Portuguese East Africa.** Greville.
 Trade of Mozambique and Quilimane for the Year 1899. Foreign Office, Annual No. 2399, 1900. Size 10 x 6, pp. 16. Price 1d.
 This report contains an account of the "prazo" system of trade-monopolies pursued in Portuguese Zambesia.
- Portuguese East Africa—Shari River.** [Wanters.]
Mouvement G. 17 (1900): 217-220.
 Les sources du Chari. *With Map.*
- Sahara.** *Globus* 77 (1900): 101-105, 126-129, 144-147. Behrens.
 Am Nordrande der Sahara. Von Dr. Wilhelm Behrens.
- Sahara—In-Salah.** *Rev. Française* 25 (1900): 69-78. Demanche.
 Occupation d'In-Salah. Par M. G. Demanche. *With Map.*
 In-Salah, which was occupied by the French in January, 1900, is situated very nearly midway between Algiers and Timbuktu.
- Sahara—Tuat.** *B. Comité l'Afrique Française* 10 (1900): 125-135. Caix.
 La marche vers le Touât. Par M. Robert de Caix. *With Maps.*
 Refers to the opening of the railway to Jenin-bu-Reszy, the most southerly point yet reached by the Algerian railways, and one from which an extension towards Tuat is possible.
- South Africa.** Guyot.
 Boers and Uitlanders. By M. Yves Guyot. Translated by Alfred Moor-Radford.
 Weston-super-Mare: Huntley Bros., 1900. Size 8 x 5½, pp. 24. Price 6d.
- South Africa.** *G.Z.* 6 (1900): 241-248. Dove.
 Further Correspondence relating to Affairs in South Africa. (In continuation of [C. 9530], October, 1899.) January, 1900. London: Eyre & Spottiswoode, 1900. Size 13¼ x 8½ pp. xiv. and 254. Price 2s. 1½d.
- South Africa.** *Globus* 77 (1900): 59-60, 76-80, 85-87. Passarge.
 Durch die Karroo nach Kimberley. Reisebriefe von Dr. S. Passarge.
- Spanish Guinea.** *B.S.G. Madrid, Rev. G. Colon. y Mercantil* (1900): 473-479. —
 La Guinea española.
- Swaziland.** *J.R. Colonial I.* 31 (1900): 468-499. Miller.
 Swaziland. By Allister M. Miller.

Transvaal.

Reed.

The Transvaal from Without. A Brief History of the Boers and their Country. By J. Howard Reed. Reprinted from the "Manchester Evening Mail." Manchester: T. Sowler & Sons, Ltd., 1900. Size $7\frac{1}{2} \times 5$, pp. 120. Price 3d. Presented by the Author.

Tunis—Kairwan.

Deutsche G. Blätter 23 (1900): 1-21.

Schurtz.

Kairuan. Von H. Schurtz.

NORTH AMERICA.**Alaska.**

Filippi.

The Ascent of Mount St. Elias [Alaska] by H.R.H. Prince Luigi Amedeo di Savoia, Duke of the Abruzzi. Narrated by Filippo de Filippi. Illustrated by Vittorio Sella, and translated by Signora Linda Villari, with the Author's supervision. London: A. Constable & Co., 1900. Size $11 \times 7\frac{1}{2}$, pp. xvi. and 242. *Portrait, Maps, and Illustrations.* Price 31s. 6d. net. Presented by the Publishers.

This sumptuous volume is the authorized English translation of the Italian work noticed in the *Journal* for May, vol. xv. (1900), p. 536. It has the advantage of having the scientific appendices revised by Prof. Ray Lankester and Prof. Judd. The translation is well done, and the reproduction of the many large photographs leaves nothing to be desired.

Canada. *A travers le Monde, Tour du Monde* 6 (1900): 181-183. Labadie-Lagrave. Le Chemin de fer du Klondyke. Par M. G. Labadie-Lagrave. *With Illustration.*

The railway from Skagway was opened to the summit of White pass in February, 1899, and to Lake Bennett a few months later; it is expected to be pushed forward to White Horse rapids by August, 1900.

Canada.

Wrong and Langton.

University of Toronto Studies. History, First Series, vol. 4. Review of Historical Publications relating to Canada for the year 1899. Edited by Prof. George M. Wrong and H. H. Langton. The University Library. Published by the Librarian, 1900. Toronto: W. Briggs; London: P. S. King & Son. Size $11 \times 7\frac{1}{2}$, pp. xii. and 230.

A critical bibliography of works relating in any way to the Dominion of Canada.

Canada—British Columbia. *P.A. Nat. Sci. Philadelphia* (1899): 501-511.

Vaux.

Additional Observations on Glaciers in British Columbia. By George and William S. Vaux, Jr.

Canada—Ethnological Survey. *Brit. Assoc. Rep.* (1899): 497-584.

Ethnological Survey of Canada. Report of the Committee. *With Illustrations.*

Canada—Nova Scotia.

Fletcher.

Geological Survey of Canada. Descriptive Note on the Sydney Coal Field, Cape Breton, Nova Scotia, to accompany a revised edition of the Geological Map of the Coal Field, being Sheets 133, 134, 135, N.S., summarized from the Reports of the Geological Survey of Canada, with the addition of later observations, by Hugh Fletcher, B.A. Ottawa, 1900. Size 10×7 , pp. 16. *Maps. Presented by the Geological Survey of Canada.*

United States.

Petermanns M. 46 (1900): 47.

Supan.

Die Höhengrenze des Baumwuchses in den Vereinigten Staaten. Von Prof. Dr. Supan.

On the upper limit of tree-growth in the United States.

United States—California. *J. Geology* 8 (1900): 42-57.

Hershey.

Ancient Alpine Glaciers of the Sierra Costa Mountains in California. By Oscar H. Hershey.

United States—Colorado. *J. School G.* 4 (1900): 45-51.

Dodge.

Life on the Colorado Plateaus. By Richard E. Dodge.

United States—Immigration.

Rossi.

L'emigrazione Italiana agli Stati Uniti nell' anno 1898-99. Rapporto del cav. Egisto Rossi.—Bollettino del Ministero degli Affari Esteri, Dicembre, 1899. Roma, 1899. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 18.

The Italian immigrants now far outnumber those of any other European nation, the figures for 1898-99 being, in round numbers, from Italy, 76,500; Austria-Hungary, 53,300; Russia, 43,700; United Kingdom, 28,000; and Germany, 13,900.

United States—Indian Territory. Savinien.

Miss. Catholiques 32 (1900): 9, 20, 34, 41, 57, 69, 76, 93, 103, 118, 127.

Voyages et aventures d'un Missionnaire dans le Far-West. Par le R. P. Savinien. With Illustrations.

United States—Louisiana. Vansittart.

Trade of New Orleans and District for the Year 1899. Foreign Office, Annual No. 2382, 1900. Size 10 × 6, pp. 28. Price 2d.

United States—Meteorology.

United States of America. Department of Agriculture, Monthly Weather Review. Volume xxvii. Prof. Cleveland Abbe, Editor. Annual Summary for 1899. Washington: Weather Bureau, 1900. Size 12½ × 10, pp. x. and 577-597. Charts. Presented by the U.S. Department of Agriculture.

United States—Naval Observatory.

Report of the Superintendent of the United States Naval Observatory for the fiscal year ending June 30, 1899. Washington, 1899. Size 9½ × 6, pp. 28. Presented by the U.S. Naval Observatory.

United States—New York. Sanderson.

Trade of New York and District for the Year 1899. Foreign Office, Annual No. 2423, 1900. Size 10 × 6, pp. 46. Price 2½d.

United States—New York. B. American G.S. 32 (1900): 102-132. Turner.

The Physical Geography of New York State. Part xi.—The Climate of New York. By E. T. Turner. With Map and Diagrams.

United States—Pueblo Indians. Hirn.

Meddelanden G. Fören. Finland 5 (1899-1900): (2) 1-68.

Skildringar ur Pueblofolkens Konstlif. Af Yrjö Hirn. With Illustrations.

On the art of the Pueblo Indians.

United States—South Atlantic States. Cœtlogon.

Trade of Charleston and District for the Year 1899. Foreign Office, Annual No. 2394, 1900. Size 10 × 6½, pp. 22. Price 1½d.

This report contains information regarding experiments in tea culture in the Southern states.

United States—Texas. P. American Philosoph. S. 38 (1899): 135-147. Haupt.

Historical Résumé of the Efforts made to demonstrate the Practicability of the Reaction Breakwater at Aransas Pass, Tex., with Results to February, 1899. By Lewis M. Haupt. With Plates.

United States—Texas. Nugent.

Trade of Texas for the Year 1899. Foreign Office, Annual No. 2391, 1900. Size 10 × 6, pp. 32. Price 2d.

United States—Washington, D.C. Phillips.

List of Maps and Views of Washington and District of Columbia in the Library of Congress. By P. Lee Phillips. Washington, 1900. Size 9½ × 6, pp. 78.

United States—West Central States. Wyndham.

Trade of Chicago and District for the Year 1899. Foreign Office, Annual No. 2414, 1900. Size 10 × 6, pp. 32. Price 2d.

CENTRAL AND SOUTH AMERICA.**Andes.** Alpine J. 20 (1900): 81-87. Conway.

The Southern Andes: an Orographical Sketch. By Sir Martin Conway. With Illustration.

This short paper summarizes a large amount of literature as well as the author's personal observations.

Argentine Republic. La G., B.S.G. Paris (1900): 389-392. Monconsin.

Notes sur les Tehuelches et sur les indigènes de la République Argentine. Par M. P. Monconsin.

Argentine Republic. G.Z. 6 (1900): 297-312. Rein.

Erläuterungen zur Geschichte der Eroberung und Basiedelung der La Plata-Länder sowie der Einführung von Pferden und Rindvieh und deren Verwilderung. Von Prof. Johannes Rein.

No. II.—AUGUST, 1900.]

Argentine Republic and Uruguay.

Garrou.

Argentina ed Uruguay: L'allevamento del bestiame e l'industria delle carni al Plata. Rapporto del M. Garrou.—*Bollettino del Ministero degli Affari Esteri*, April, 1900. Roma, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 32.

On cattle-rearing and the meat industry.

Brazil—Para.

Churchill.

Trade of Para for the years 1898 and 1899. Foreign Office, Annual No. 2389, 1900. Size 10×6 , pp. 10. Price 1d.

British Guiana.

J.R. Colonial L 31 (1900): 232-260.

im Thurn.

British Guiana and its Boundary. By Everard F. im Thurn.

British Guiana and Venezuela.

Vasco.

Rev. Française 25 (1900): 14-19.

L'Arbitrage Anglo-Vénézuélien. Par M. G. Vasco. With Map.

Central America—Ship-Canal.

United States. No. 1 (1900). Convention between Her Majesty and the United States of America supplementary to the Convention of April 19, 1850, relative to the Establishment of a Communication by Ship-Canal between the Atlantic and Pacific Oceans. Signed at Washington, February 5, 1900. London: Eyre & Spottiswoode, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 6. Price 1d.

Dutch West Indies—Curaçoa.

Jesurun.

Trade of Curaçoa and its Dependencies for the year 1899. Foreign Office, Annual No. 2392, 1900. Size $9\frac{1}{2} \times 6$, pp. 26. Price 2d.

Guatemala.

B.S. d'Études Colon. 7 (1900): 272-282.

Le Caoutchouc au Guatemala. With Illustration.

Guatemala.

B.S. d'Études Colon. 7 (1900): 184-196.

Morren.

La Culture du Café au Guatemala. Extrait de l'ouvrage "Koffiecultuur in Guatemala." Par F.-W. Morren.

Nicaragua.

National G. Mag. 11 (1900): 156-161.

Hayes.

An Assumed Inconstancy in the Level of Lake Nicaragua: a Question of Permanency of the Nicaragua Canal. By C. Willard Hayes.

Controverts the conclusions of Prof. Heilprin as to the changes in the level of Lake Nicaragua.

Paraguay.

Globus 77 (1900): 191-193.

Endlich.

Zur Etymologie des Wortes "Paraguay." Von Dr. Rud. Endlich.

Suggestions as to the probable origin of the Guarani name Paraguay.

Patagonia.

National G. Mag. 11 (1900): 41-55.

Hatcher.

Some Geographic Features of Southern Patagonia, with a discussion of their origin. By J. B. Hatcher. With Illustrations.

This is referred to in the *Journal* for April, p. 424.

Patagonia.

American J. Sci. 9 (1900): 85-108.

Hatcher.

Sedimentary Rocks of Southern Patagonia. By J. B. Hatcher. With Map.

Venezuela—Boundary.

National G. Mag. 11 (1900): 129-144.

Baker.

The Anglo-Venezuelan Boundary Dispute. By Marcus Baker. With Sketch-map and Illustrations.

Venezuela—Ciudad Bolívar.

Lemoine.

Trade of Ciudad Bolívar for the year 1899. Foreign Office, Annual No. 2388, 1900. Size 10×6 , pp. 6. Price $\frac{1}{2}$ d.

AUSTRALASIA AND PACIFIC ISLANDS.**Australia—Year-Book.**

Greville.

The Year-Book of Australia for 1900. Edited by the Hon. Edward Greville. London: Kegan Paul & Co. Size 9×6 , pp. 860. Maps and Illustrations. Price 10s. 6d. Presented by the Agent-General for New South Wales.

Cook's Voyage—Botany.

Banks and Solander.

Illustrations of the Botany of Captain Cook's Voyage Round the World in H.M.S. Endeavour in 1768-71. By the Right Hon. Sir Joseph Banks, Bart., and Dr. Daniel Solander, F.R.S. With Determinations by James Britten. Part i.—

Australian Plants. London, printed by order of the Trustees of the British Museum: Longmans & Co., 1900. Size $19\frac{1}{2} \times 13$, pp. 32 [100 plates]. *Presented by the British Museum.*

The plates, now printed for the first time, were engraved on copper at the expense of Sir Joseph Banks, and in spite of their hundred years of oblivion, they have produced admirable impressions. The description of the plates is given in Latin, revised by Mr. J. Britten. Mr. George Murray, in the preface, promises a detailed introduction with the final part.

Gambier Islands.

Tregear.

New Zealand Institute. Mangareva Dictionary, Gambier Islands. By Edward Tregear, Wellington, 1899. Size 10×6 , pp. 122.

New Guinea.

Meteorolog. Z. 17 (1900): 157-164.

Danckelman.

Klima von Neu-Guinea. Von Prof. Dr. A. v. Danckelman.

New South Wales—Darling River. *P.L. Civil Engineers* 139 (1900): 259-264. Poole.

Rapid Preliminary Surveys on the Darling River, N.S.W. By William Poole, jun. *With Diagram.*

The survey was made for the purposes of navigation, with a view to improving the river.

New South Wales.

New South Wales Statistical Register for 1898 and previous years. Sydney, 1899. Size $10 \times 6\frac{1}{2}$, pp. viii. and 974. *Presented by the Agent-General for New South Wales.*

Pacific.

American J. Sci. 9 (1900): 369-374.

Agassiz.

Explorations of the *Albatross* in the Pacific. By Alexander Agassiz. IV. See also *Science* 11 (1900): 574-578.

This is noticed in the *Journal* for June, p. 649.

Pacific Ocean—Cable.

Canada—Australia. Further Correspondence relating to the Proposed Construction of a Cable across the Pacific Ocean. London: Eyre & Spottiswoode, 1900. Size $13 \times 8\frac{1}{2}$, pp. x. and 50. *Sketch-map.* Price 10½d.

Paumotus.

American J. Sci. 9 (1900): 109-116.

Agassiz.

Explorations of the *Albatross* in the Pacific. II. The Paumotus. By Alexander Agassiz.

Queensland—Almanac and Directory.

Pugh.

Pugh's Almanac and Queensland Directory for 1900. Brisbane: Gordon & Gotch. Size $9 \times 5\frac{1}{2}$, pp. 1090.

Samoa.

Hunter.

Trade of Samoa for the year 1899. Foreign Office, Annual No. 2419, 1900. Size $10 \times 6\frac{1}{2}$, pp. 10. Price 1d.

Samoa.

Petermanns M. 46 (1900): 8-12.

Krämer.

Die angeblichen Hebungen und Senkungen in Samoa, nebst einigen geographischen Notizen von Dr. Augustin Krämer.

Samoa.

M.G. Ges. Jena 18 (1900): 1-29.

Kurze.

Die Samoaner in der heidnischen Zeit. Von Dr. G. Kurze.

Samoa.

Globus 77 (1900): 117-123.

Reinecke.

Die wirtschaftliche Bedeutung Samoas und die deutschen Pflanzungen. Von Dr. Reinecke. *With Map.*

POLAR REGIONS.

Antarctic—German Expedition. *Verh. Ges. Erdk. Berlin* 27 (1900): 221-231.

Die Deutsche Südpolar-Expedition.

Antarctic—Scottish Expedition. *Scottish G. Mag.* 16 (1900): 352-357

Bruce.

The Proposed Scottish National Antarctic Expedition. By W. S. Bruce. *With Chart.* Also separate copy. *Presented by the Author.*

Greenland.

Den hvita polarvargens invandring till östra Grönland. Size 9×6 , pp. [8]. *Sketch-map.* *Presented by the Author.*

On the game of Northern Greenland, especially the white wolf.

Greenland. *J. Geology* 7 (1899): 655-666. **Watson.**

Some Notes on the Lakes and Valleys of the Upper Nugsuak Peninsula, North Greenland. By Thomas L. Watson.

Norwegian Arctic Expedition. *Nautical Mag.* 69 (1900): 226-229. **Plumstead.**

Dr. Nansen and his Scientific Results. By E. Plumstead.

This paper reasserts the writer's previous opinion as to the uncertainty of certain observations by Dr. Nansen.

Spitsbergen. **Carlheim-Gyllensköld.**

Öfversigt K. Vet. A. Förhand, Stockholm 56 (1899): 631-652, 887-919.

Travaux de l'expédition suédoise au Spitzbergen, 1898, pour la mesure d'un arc du méridien. Par V. Carlheim-Gyllensköld. (Nos. 1 and 3 in French; No. 2 in Swedish.)

Spitsbergen—Hudson's Voyage. **Conway.**

Hudson's Voyage to Spitsbergen in 1607. By Sir Martin Conway. (From the *Geographical Journal* for February, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 10. *Charts.*

MATHEMATICAL GEOGRAPHY.

Eclipse Calculations.

Local Particulars of the Total Eclipse of the Sun, 1901, May 17-18. (*Nautical Almanac Circular*, No. 18.) Size $10 \times 6\frac{1}{2}$, pp. 8. *Map.*

The central line of this eclipse runs just south of the equator across Sumatra and Borneo, then curves southward through Celebes, Ceram, and the southern part of New Guinea.

Latitude Changes.

Albrecht.

Centralbureau der Internationalen Erdmessung. Bericht über den Stand der Erforschung der Breitenvariation am Schlusse des Jahres 1899. Von Th. Albrecht. Berlin: G. Reimer. 1900. Size $11\frac{1}{2} \times 9$, pp. 26. *Plate.*

Latitude Determination. *Atti R.A. Lincei, Rendiconti* 9 (1900): 189-196.

Reina.

Determinazione astronomica di latitudine e di azimut eseguita a Monte Pisarello nel 1899. Nota del Prof. Vincenzo Reina.

On a method of fixing the latitude which gave a probable error of only $\pm 0''\cdot 07$.

Magnetic Instrument. *Vierteljahrs. Naturfor. Ges. Zürich* 44 (1899): 246-256. **Wild.**

Ergänzungen zu meinem magnetischen Reise-Theodolith behufs unabhängiger absoluter Messungen der Horizontalintensität. Von H. Wild.

Map-reading. *Z. Deutsch. u. Österreich. Alpenv.* 30 (1899): 133-143. **Obermair.**

Einiges über Kartenlesen, Höhenmessung und Orientierung im Gelände. Von Obermair, Rgl. bayr. Oberstleutnant.

On map-reading, and the use of maps in finding one's position or one's way.

Nautical Almanac.

The Nautical Almanac and Astronomical Ephemeris for the year 1903. Also Part i. (containing such portions as are essential for Navigation). Published by order of the Lords Commissioners of the Admiralty. London: Eyre and Spottiswoode. Size $9\frac{1}{2} \times 6$, pp. xiv., 646, and 18; (Part i.) xiv. and 310. Price 2s. 6d. Part i. 1s. *Presented by the Admiralty.*

Photographic Surveying.

Lee.

Photographic Surveying. Paper by J. Bridges Lee, M.A. Read at the Royal United Service Institution, October 2, 1899. London: Published by the Society of Engineers, 1899. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 171-202. *Illustrations. Presented by the Author.*

Position at Sea. *Ann. Hydrographie* 28 (1900): 84-89.

Börger.

Ueber die Auflösung des Zweihöhen-Problems nach einer Näherungsmethode von Raper, unter Benützung der Tabelle der Mercatorschen Funktionen. Von Prof. Dr. C. Börger.

On the solution of double-altitudes by Raper's method of approximations with the aid of a table of Mercator functions (meridional parts).

Surveying. *P.I. Civil Engineers* 139 (1900): 273-285.

Dempster.

Railway Surveying with the Tacheometer. By H. G. Dempster. *With Plate.*

Time. *Nautical Mag.* 69 (1900): 259-271.

Allingham.

Time and its Curious Contradictions. By William Allingham.

- Time and Prime Meridian.** *Riv. G. Italiana* 7 (1900): 9-19, 115-130. **Rajna.**
 Appendice a una discussione su l'unificazione del calendario, il meridiano iniziale per le longitudini e l'ora universale del Dott. Michele Rajna.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

- Aurora.** *C. Rd.* 130 (1900): 1276-1279. **Aręowski.**

Notice sur les aurores australes observées pendant l'hivernage de l'expédition antarctique belge. Note de M. Henryk Aręowski.

This paper is identical with that contributed by M. Aręowski to the *Geographical Journal*, and published at p. 92.

Climatology.**Woeikof.**

A. Woeikof. Climat des Hauteurs de l'Europe occidentale. [In Russian.] (Avec résumé en langue française.) St. Petersburg, 1900. Size 11 x 7½, pp. 69-212. *Diagrams. Presented by the Author.*

On the climate of the top of the Eifel tower, some other towers, and various isolated mountains in Western Europe, compared with the conditions at the level of the ground.

- Geology—Age of the Earth.** *Brit. Assoc. Rep.* (1899): 718-730. **Geikie.**

Section C.—Geology. Presidential Address by Sir Archibald Geikie, D.C.L., etc.

Geomorphology.**Lubbock.**

On the Configuration of the Earth's Surface, with special reference to the British Islands. By the Right Hon. Sir John Lubbock, Bart., M.P., etc. (From the *Geographical Journal* for January, 1900.) Size 10 x 6½, pp. 4.

- Geomorphology.** *Rev. G. Italiana* 7 (1900): 196-200.

Marinelli.

Idee morfologiche di Carlo Gemmellaro. Nota di Olinto Marinelli.

Gemmellaro was born in Catania in 1787, studied in London under Sir Humphry Davy, spent most of his life in the study of the geology of Sicily, and died in 1866. The author claims for him priority in the application of geographical ideas to geology in the study of geomorphology.

- Glaciers.** *Deutsche Rundschau G.* 22 (1900): 309-316, 348-354. **Petermann.**

Gletscher und Firneere. Alpenkundlich-historische Studie. Von Reinhard E. Petermann. *With Illustrations.*

- Glaciers.** *Petermanns M.* 46 (1900): 77-81. **Richter.**

Die Gletscherkonferenz im August 1899. Von Prof. Dr. E. Richter.

- Meteorology—Fogs.** *Contemporary Rev.* 77 (1900): 533-540. **Bacon.**

Fogs and their teaching. By the Rev. J. M. Bacon.

- Meteorology—Instrument.** *Ann. Hydrographie* 28 (1900): 227-232. **Maurer.**

Prüfung eines neuen Anemometers von R. Gradenwitz und Theorie dieses Instrumentes. Von Dr. Hans Maurer.

- Meteorology—Rain.** **Hildebrandsson.**

K. Svensk. Vet.-A. Handlingar 32 (1899) (No. 4): 1-22.

Quelques recherches sur les centres d'action de l'atmosphère. II. La pluie. Par H. Hildebrand Hildebrandsson. *With Diagrams.*

Discusses a large number of relations between the seasonal distribution of rainfall at places the geographical positions of which are similar or contrasted.

- Meteorology—Tides.** *C. Rd.* 130 (1900): 861-863. **Poincaré.**

Sur la comparaison des mouvements barométriques provoqués, à la latitude 50° du méridien de Greenwich, par la marche en déclinaison du Soleil et de la Lune. Note de M. A. Poincaré.

- Meteorology—Upper Atmosphere.** *National G. Mag.* 11 (1900): 55-62. **Frankenfield.**

Kite Work of the Weather Bureau. By H. C. Frankenfield.

- Oceanography.** *Scottish G. Mag.* 16 (1900): 299-312.

The International Conference for Marine Research, Stockholm, 1899; and Report of the Swedish Hydrographic Commission. *With Diagrams.*

- Oceanography.** *Petermanns M.* 46 (1900): 61-65, 81-92. **Petersson.**

Die Wasserzirkulation im Nordatlantischen Ozean. Von Dr. O. Petersson. *With Charts, etc.*

- Oceanography.** *Petermanns M.* 46 (1900): 1-7, 25-34. **Pettersson.**
Die hydrographischen Untersuchungen des Nordatlantischen Ozeans in den Jahren 1895-1896. Von Dr. O. Pettersson. *With Charts and Diagrams.*
A comprehensive study of the movements of the water in the North Atlantic.
- Oceanography—Apparatus.** *Atti R.A. Lincei Rendiconti* 9 (1900): 71-72. **Guglielmo.**
Intorno ad alcuni nuovi areometri ad immersione totale, ad inclinazione variabile e a riflessione. Nota II, di G. Guglielmo.
- Oceanography—Baltic.** *Meddelanden G. Fören. Finland* 5 (1899-1900) (4): 1-26. **Olsson.**
Några iakttagelser öfver hafsvattnets salthalt i Finska Skärgårdshafvet. Af P. Hj. Olsson. *With Diagrams.*
On the salinity of the sea-water in the Finnish archipelago. There is a brief summary in German.
- Oceanography—Currents.** **Purey-Cust.**
Report on the Undercurrents in the River Congo, West Africa, from Observations by Commander H. E. Purey-Cust, R.N., H.M.S. *Rambler*, 1899. London: J. D. Potter, 1900. Size $13 \times 8\frac{1}{2}$, pp. 8. *Chart. Price 1s. Presented by the Hydrographic Department, Admiralty.*
- Oceanography—Deposits.** *C. Rd.* 130 (1900): 1420-1422. **Thoulet.**
Analyse de fonds marins recueillis dans l'Iroise. Note de M. J. Thoulet.
On the method of examining the marine deposits obtained from the channel off Brest.
- Oceanography—Norwegian Expedition.** **Nordgaard.**
The Norwegian North-Atlantic Expedition, 1876-1878. XXVII. Zoology: Polyzoa. By O. Nordgaard. Christiania: Printed by Grøndahl & Søn, 1900. Size $15 \times 11\frac{1}{2}$, pp. 30. *Map and Plate. Presented by the Editorial Committee.*
- Oceanography—River Entrances.** **Ekman.**
Öfversigt K. Vet. A. Förhand. Stockholm 56 (1899): 479-507.
Ein Beitrag zur Erklärung und Berechnung des Stromverlaufs an Flussmündungen. Von Walfrid Ekman.
Mathematical explanation of the action of river and sea water at the entrance of rivers into the sea.
- Oceanography—"Valdivia" Expedition.** **Schott.**
The Oceanographical and Meteorological Work of the German *Valdivia* Expedition. By Dr. G. Schott. (From the *Geographical Journal* for May, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 12.
- Physical Geography.** *M.G. Ges. Wien* 43 (1900): 3-14. **Günther.**
Die Bedeutung De la Métherie's für die Entwicklung der physikalischen Erdkunde. Von Prof. Dr. Siegmund Günther.
On the services rendered to the theory of physical geography by de la Métherie towards the end of the eighteenth century.
- Sand-dunes.** **Cornish.**
Formation des Dunes de Sable. Par Vaughan Cornish. (Article paru dans le numéro de Mars 1897 du *Geographical Journal*.) Traduit de l'Anglais par Émile Cammaerts. (Université Nouvelle, Institut Géographique de Bruxelles. Publication No. 2.) Bruxelles, 1900. Size $10 \times 6\frac{1}{2}$, pp. 38. *Illustrations. Presented by the Author.*
- Seismology.** *Atti R.A. Lincei, Rendiconti* 9 (1900): 204-210. **Agamennone.**
Sismoscopio elettrico a doppio effetto per le scosse sussultorie. Nota di G. Agamennone. *With Illustrations.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

- Commercial Geography—Cables.** *J.S. Arts* 48 (1900): 591-606. **Sassoon.**
Imperial Telegraphic Communication. By Sir Edward A. Sassoon, Bart., M.P.
- Commercial Geography—Mines.** **Foster.**
Mines and Quarries: General Report and Statistics for 1898. Part iv. Colonial and Foreign Statistics. Statistics relating to persons employed, output, and accidents at mines and quarries in the British Colonies and in Foreign Countries. Edited by C. Le Neve Foster, D.Sc., F.R.S. London: Eyre & Spottiswoode, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 269-435. Price 1s. $4\frac{1}{2}$ d. *Presented by the Secretary of State, Home Office.*

Commercial Geography—Steam Navigation. *Brit. Assoc. Rep.* (1899): 837-853. **White.**
Section G.—Mechanical Science. Presidential Address by Sir W. H. White,
K.C.B., etc.

Historical—Phœnicia. **Reclus.**
La Phénicie et les Phéniciens. Par Elisée Reclus. Extrait du *Bulletin de la Société Neuchâteloise de Géographie*, tome xii. Neuchâtel, 1900. Size 9 × 6½,
pp. 16. *Map.* Presented by the Author.

Historical—Ships. *B.S.G. Lisboa* 17 (1899): 5-72. **Barcellos.**
Construções de naus em Lisboa e Goa para a carreira da India no começo do
seculo xvii.

Historical—The Compass. *Riv. G. Italiana* 7 (1900): 65-108. **Bertelli.**
Appunti storici intorno all' uso topografico ed astronomico della bussola fatto
anticamente in Italia del P. Timoteo Bertelli.

On the ancient use of the magnetic compass in surveying operations in Italy.

Historical—Verrazano and Florin. *B.S.G. Italiana* 1 (1900): 402-409. **Peragallo.**
Ancora sulla distinta personalità di Giovanni da Verrazzano, navigatore, e di
Giovanni Florin, Corsaro. Lettera del P. Peragallo.

Settlements. *G.Z.* 6 (1900): 248-262. **Schlüter.**
Die Formen der ländlichen Siedelungen. (Nach A. Meitzen.) Von Dr. Otto
Schlüter. *With Map and Plate.*

On the different types of villages, with a map of Europe showing the prevalence
of eight different types of settlement, generalized from the work of A. Meitzen.

BIOGRAPHY.

Edwards. *La G., B.S.G. Paris* (1900): 349-354. **Grandidier.**
Alphonse Milne Edwards (1835-1900). Par M. A. Grandidier. *With Portrait.*
M. Alphonse Milne Edwards, president of the Paris Geographical Society, was
born October 13, 1835, and died April 21, 1900.

Hunter. *Fortnightly Rev.* 67 (1900): 1033-1044. **Marriott.**
A Great Anglo-Indian: Sir William Wilson Hunter and his Work. By J. A. R.
Marriott.

Marinelli. *Riv. G. Italiana* 7 (1900): 241-253. **Mori and Frescura.**
Giovanni Marinelli.
Prof. Giovanni Marinelli, a distinguished Italian geographer, founder and editor of
the *Revista Geografica Italiana*, was born in Udine February 28, 1846, and died at
Florence, May 2, 1900.

Paulitschke. *Deutsche Rundschau G.* 22 (1900): 326-328. ———
Dr. Philipp Paulitschke. *With Portrait.*

Dr. Paulitschke was born in 1852; he travelled largely in East Africa, and died
on December 11, 1899, at Vienna.

Poesche. *Deutsche Rundschau G.* 22 (1900): 278-279. ———
Dr. Theodor Poesche. *With Portrait.*

Dr. Poesche was born in Germany in 1824, emigrated to the United States in 1850,
and devoted much attention to ethnographical questions. He died on December 27,
1899.

Wagner. *Petermanns M. (G. Anzeiger)* 46 (1900): 77-81. **Sievers.**
Hermann Wagner. Von W. Sievers. *With Portrait.*

GENERAL.

Army Medical Report.

Army Medical Department. Report for the Year 1898. With Appendix.
Volume xi. London: Eyre & Spottiswoode, 1900. Size 10 × 6, pp. x. and 592.
Price 2s. 7d. Presented by the Army Medical Department.

This report contains as an appendix a summary of the meteorological observations
taken at Netley and at military stations abroad in the year 1898.

Bordeaux Geographical Society. *B.S.G. Com. Bordeaux* 26 (1900): 139-150. **Manès.**
Les vingt-cinq années de la Société de géographie commerciale de Bordeaux
(1874-1899). Par M. J. Manès.

- Eclipse.** Todd and Brown.
Total Eclipse of the Sun, May 28, 1900. Prepared . . . by Prof. H. D. Todd and Prof. S. J. Brown. (Supplement to the *American Ephemeris*, 1900.) Washington: Bureau of Equipment, 1900. Size 10×7 , pp. 32. *Charts and Illustration.*
- Economics.** Levasseur.
Comparaison du travail à la main et du travail à la machine. Par E. M. Levasseur. Paris, 1900. Size $11\frac{1}{2} \times 9$, pp. 106. *Illustrations. Presented by the Author.*
- Educational.** Petermanns M. 46 (1900): 92-95.
Der geographische Unterricht an den deutschen Hochschulen im Sommersemester 1900.
Particulars of the courses of instruction offered in the universities and colleges of Germany in geography and allied subjects for the current term.
- Educational—Methods.** National G. Mag. 11 (1900): 62-78. Davis.
Practical Exercises in Geography. By Prof. W. M. Davis.
Exercises in mathematical geography for practical use in schools.
- Geographical Chronology.** Deutsche G. Blätter 23 (1900): 58-63. Wolkenhauer.
Die Entwicklung der Geographie im xix Jahrhundert in einigen Merkszahlen. Von W. Wolkenhauer.
- Geographical Congress.** Leclercq.
Le septième congrès international de géographie à Berlin. Par Jules Leclercq. (Extrait des Bull. de l'Acad. roy. de Belgique (Classe des lettres, etc.), No. 11, pp. 791-800, 1899.) Size 9×6 . *Presented by the Author.*
- Geographical Definitions.** J. School G. 4 (1900): 52-58. Curtin.
Some Common Geographical Definitions. By Margaret H. Curtin.
- Geographical Progress.** La G., B.S.G. Paris (1900): 197-228. Hulot.
Rapport sur les progrès de la Géographie en 1899. Par le Baron Hulot. *With Maps.*
- Geographical Terminology.** Riv. G. Italiana 7 (1900): 131-136. Marinelli.
Superficie geologica e superficie geografica. A proposito di alcuni termini d'uso promiscuo. Per Olinto Marinelli.
- Geography.** Lespagnol.
La conception actuelle de la Géographie. Leçon d'ouverture du cours de Géographie professé à la Faculté des Letters. Par M. G. Lespagnol. Lyon: A. Storck & C^e, 1900. Size $10 \times 6\frac{1}{2}$, pp. 20. *Presented by the Author.*
On the modern conception of geography—the opening lecture of a course at Lyons.
- German Colonies.** Townley.
German Colonial Estimates for 1900. Foreign Office, Miscellaneous, No. 524, 1900. Size $10 \times 6\frac{1}{2}$, pp. 12. *Price 1d.*
The imperial exchequer is asked to provide £1,300,000 towards the expenses of the German colonies for 1900.
- German Colonies—Bibliography.** Brose.
Die deutsche Kolonialliteratur im Jahre 1898. Zusammengestellt von Maximilian Brose. Sonder-Heft der Beiträge zur Kolonialpolitik und Kolonialwirtschaft, herausgegeben von der Deutschen Kolonialgesellschaft. Berlin: W. Süßerott, 1900. Size 10×7 , pp. 38. *Price 80 pf. Presented by the Deutschen Kolonialgesellschaft.*
The titles are classified under the names of the respective colonies.
- Ice-breaker.** Makarov.
The *Yermak* Ice-breaker. By Vice-Admiral Makarov. (From the *Geographical Journal* for January, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 14. *Chart and Illustrations.*
- Lyons Geographical Society.**
Société de Géographie de Lyon et de la Région Lyonnaise. Notice historique. (Supplément au Bulletin de la Société de Géographie de Lyon du 1^{er} Avril, 1900.) Lyon, 1900. Size $10 \times 6\frac{1}{2}$, pp. 76. *Frontispiece. Presented by the Société de Géographie de Lyon.*
- Meteorological Congress.**
Atti del IV. Congresso Meteorologico Italiano promosso dalla Società Meteorologica Italiana tenuto a Torino dal 12 al 15 settembre 1898. Torino, 1899. Size $7\frac{1}{2} \times 5$, pp. 168. *Presented by the Società Meteorologica Italiana.*

Mountaineer's Equipment.

Catalogue of Equipment for Mountaineers. Exhibited at the Alpine Club, December, 1899. London. Size 9 x 6, pp. 48. *Illustrations. Presented by the Alpine Club.*

Place-Names. *Blackwood's Mag.* 167 (1900): 527-540.

Maxwell.

Names of Places. By Sir Herbert Maxwell, Bart., M.P.

A popular paper on the historical changes of ancient place-names in the British Islands, with suggestions as to the normal evolution of names.

Slavery.

Sixty Years against Slavery. A Brief Record of the Work and Aims of the British and Foreign Anti-Slavery Society, 1839-1899. With an article on the Abolition of the Legal Status of Slavery. By Joseph G. Alexander, LL.B. London: Published at the Offices of the Society. Size 9 x 7½, pp. 16.

NEW MAPS.

By E. A. REEVES, *Map Curator, R.G.S.*

EUROPE.**Austria-Hungary.**

Military Geographical Institute, Wien.

Hypsometrische Karte von Oesterreich-Ungarn. K. u. k. militär-geographisches Institut, Wien. Scale 1: 750,000 or 12 stat. miles to an inch. Sheet D4: Semlin, Alt-Orsova, Belgrad, Užice.

England and Wales.

Ordnance Survey.

Publications issued since June 8, 1900.

1-inch:—

ENGLAND AND WALES (revision):—124, 173, 183, 190, 227, 244 (275 and 291), (357 and 360). Hills engraved in black or brown. 1s. each.

6-inch—County Maps:—

ENGLAND AND WALES (revision):—**Berkshire**, 4 s.w., s.e., 5 n.e., s.w., s.e., 6 s.w., 8 n.w., 9 n.w., n.e., s.w., 10 n.w., s.e., 11 s.w., 13 complete, 14 complete, 15 n.w., n.e., s.w., 16 n.w., s.w., 19 n.e., s.w., s.e., 20 complete, 21 complete, 22 n.w., n.e., s.w., 24 s.w., 25 n.w., 26 complete, 27 complete, 28 n.w., n.e., s.w., 29 n.w., 30 n.e., s.w., s.e., 31 n.w., n.e., s.w., 34 n.e., s.w., 36 complete, 37 s.w., s.e., 38 n.w., n.e., s.e., 39 n.w., s.w., s.e., 45 n.w., n.e., s.w., 46 n.e., 47 n.w., 49 n.e. **Bucks**, 18 n.w., s.e., 19 n.e., s.w., 20 n.w., s.e., 21 n.e., s.e., 22 n.w., 23 n.w., n.e., s.w., 24 s.w., s.e., 26 n.e., 27 s.e., 32 n.e., 40 n.e., 54 s.w., 55 n.e. **Denbigh**, 5 s.w., 9 n.e., s.e., 14 n.e. **Derbyshire**, 34 n.w. **Flint**, 1 s.e., 2 n.w., n.e., s.w., s.e., 4 n.e., s.w., 5 n.w., n.e., 6 s.w., 8 n.e., s.e., 12 n.e. **Oxfordshire**, 22 s.e., 23 n.e., 24 s.e., 25 s.w., 31 s.e., 33 n.e., 34 n.w., 36 n.e., 37 n.e., s.w., s.e., 38 complete, 40 n.w., s.w., s.e., 41 s.w., 44 n.w., 45 n.w., s.e., 46 complete, 47 n.w., s.w., 49 n.w., n.e., 50 s.w., 52 complete, 53 n.w., s.w., 55 n.w., n.e., 56 n.w., 57 s.w. **Wiltshire**, 24 n.w. 1s. each.

25-inch—Parish Maps:—

ENGLAND AND WALES (revision):—**Anglesey**, I. 3, 16; II. (2 and 6) 9, 10, 11, 12, 14; III. 1, 2, 10, 13; V. 4, 8, 12, 14, 15; VI. 2, 5, 6, 7, 11, 12, 14, 15, 16; VII. 4, 7, 8; VIII. 5; XII. 3, 4, 11; XIII. 5, 15; XIV. 14; XIX. 1, 2, 3, 6, 7, 8. **Berkshire**, XII. 16; XLII. 4, 8; XLIII. 9, 10, 13, 14; XLIIA. 1, 2; XLIII. 10. **Carnarvon**, XXIII. 10. **Cumberland**, XLV. 16; XLVI. 13, 14; XLVII. 4, 6, 9, 10; XLVIII. 1, 3, 4, 7; XLIX. 1, 2, 5, 6; LHI. 3, 4, 15; LIV. 1, 3, 5; LIX. 3, 5; LXVI. 3. **Derbyshire**, XXXVI. 10; XLII. 8; XLIV. 1, 3, 5, 6, 7, 8, 9, 10, 11. **Glamorganshire**, XVIII. 12; XXVIII. 13; L. 3, 5; L. 12. **Northamptonshire**, XLIX. 6, 7, 8, 9, 14, 16; L. 7, 9, 10, 11, 13, 14, 15, 16; LI. 14, 15; LII. 5, 11, 13; LV. 1, 2, 3, 4, 5, 8, 10, 13, 14; LVI. 2, 3, 4, 5, 8, 10, 11, 12, 14, 16; LVIII. 16; LIX. 8, 9. **Notts**, XXVII. 10, 15; XXVIII. 10, 11, 14, 15; XXXIV. 1; XXXV. 1, 2; XXXVI. 1, 5, 6, 9, 13; L. 13. **Staffs**, XVIII. 13, 15, 16; XIX. 13, 14; XX. 2, 4, 8, 13. **Wilts**, VIII. 14; XIV. 9, 15; XIX. 11; XX. 1, 2, 4; XXI. 1, 2, 3, 5, 6, 7, 9, 10; XXII. 7, 10; XXIII. 5, 13; XXIX. 2, 5, 10, 11; XXXVII. 16; XLIII. 4, 8. 3s. each.
(E. Stanford, Agent.)

Ireland.**Bartholomew.**

Reduced Ordnance Survey of Ireland. Scale 1: 253,440 or 4 stat. miles to an inch. Sheet 2: Belfast and N.E. Counties. J. Bartholomew & Co., Edinburgh. Price 2s. mounted on cloth. Presented by the Publishers.

This sheet of Bartholomew's Reduced Ordnance Survey of Ireland, like the others of the series, shows the relief of the land by tinted contours. It also gives, as an inset, a small plan of Belfast.

Paris.**Fasquelle.**

Plan de l'Exposition Universelle de 1900, et de son annexe de Vincennes, d'après les documents officiels. Scale 400 feet to an inch. Paris: Eugene Fasquelle.

This is a popular plan of the Paris exhibition buildings and grounds, printed in colours, and will doubtless be useful to visitors.

ASIA.**Asia.****Service Géographique de l'Armée, Paris.**

Asie. Scale 1: 1,000,000 or 15·8 stat. miles to an inch. Sheet: Nagasaki. Service Géographique de l'Armée, Paris. Price 1·25 fr.

In view of what is now happening in the Far East, and of events which are likely to take place there in the immediate future, the map, of which this sheet forms a section, is likely to prove extremely useful. It is clearly printed in colours, roads in red, water blue, and railways and lettering in black. The relief is shown by hill shading, and depths of the water are indicated in metres by contour lines and figures. This sheet shows southern Japan in the neighbourhood of Nagasaki, and the north-west corner contains the south-east portion of Korea, thus completing the map of that country, of which parts have previously appeared on other sheets.

China.**Madrolle.**

Atlas de l'Empire Chinois. Par Cl. Madrolle. Scale 1: 1,000,000 or 15·8 stat. miles to an inch. Sheets: Tà-tsién-loû, Iûn-nân. Paris: Millet.

Each of these sheets represents an area of about 38,500 square miles; the first includes the country around Yunnan fu, the capital of Yunnan, and the second Ta-sien lu and neighbourhood, and the region to the west, in the province of Sechuan. They form part of Madrolle's Atlas de l'Empire Chinois, and are drawn on the scale of 1: 1,000,000, in accordance with the map of the Pavie mission. There is no hill shading, and the maps are somewhat roughly printed in blue and black. Travellers' names are given, and altitudes are indicated in metres.

China, Japan, and Korea.**Bartholomew.**

Bartholomew's Special Map of China, Japan, and Korea. Scale 1: 6,000,000 or 95 stat. miles to an inch. J. Bartholomew & Co., Edinburgh, 1900. Price 2s. mounted on cloth. Presented by the Publishers.

In addition to the general map, this sheet contains, as insets, a small map of the greater part of Asia, showing means of communication between the principal Chinese ports and other parts of the continent; a map showing the spheres of European influence in China; a plan of Hong Kong, with the country as far as Canton, and indicating the new boundary of British territory on the mainland; a plan of Peking and the neighbourhood, including Tiên-tsin fu and Taku forts, with the railway to Peking, which is, however, not quite correctly shown; a plan of Peking itself, on a somewhat larger scale, and a small plan of Tokio bay, showing Tokio and Yokohama. This sheet will be very useful for general reference in connection with the present crisis in China.

AFRICA.**Africa.****Service Géographique de l'Armée, Paris.**

Carte d'Afrique. Scale 1: 2,000,000 or 31·6 stat. miles to an inch. Sheets: 18, Gao-Gao; 25, Sokoto; 26, Kouka. Service Géographique de l'Armée, Paris. Price 1 fr. each sheet.

These are revised editions of three sheets of this very useful map of Africa, published by the Service Géographique de l'Armée, Paris, and include the course of the Niger from the upper part of its great bend to just below Lokoja, where it is joined by the Benué, the whole of the latter river, Lake Chad, and portions of the adjacent territories.

Algeria.

Service Géographique de l'Armée, Paris.

Carte d'Algerie. Scale 1:50,000 or 0·8 stat. mile to an inch. Sheet 136:

Boghar. Service Géographique de l'Armée, Paris. Price 1.50 fr.

AMERICA.**Peru.**

Raimondi.

Mapa del Peru. Scale 1:500,000 or 7·8 stat. miles to an inch. A. Raimondi.
Engraved and printed by Erhard Bros., Paris. Sheets: 23, Amapo; 27, Pele-
chuco; 29, Arequipa.

South America.

Bartholomew.

Commercial Map of South America. Scale 1:10,000,000 or 158 stat. miles to an
inch. J. Bartholomew & Co., Edinburgh, 1900. Price 3s. mounted on cloth.
Presented by the Publishers.

This is a good general map of South America, and, although on a rather small
scale, contains a great deal of useful information, especially in connection with rail-
ways, steamer lines and the navigability of the rivers. The latter is a very important
subject, and has evidently received considerable attention from Mr. John Samson, of
the *South American Journal*, who has revised the map. The extent to which a river is
navigable for large trading boats is clearly indicated by its course being shown in
a broad blue line, while those sections that are only navigable for small boats are
given in a dotted blue line. The new boundary between British Guiana and
Venezuela is laid down; but it would have been better if no attempt had been
made to show those parts of the frontier between Chile and the Argentine Republic
that are now under discussion. True, in certain sections this boundary is not
shown by a hard line, as is the case with others, but there are regions where,
under the present circumstances, it would have been better to have left it out
altogether. The line could easily have been added in a later edition of the map.
The general direction of that part of this frontier which has been definitely arranged
in the Puna de Atacama is fairly correctly laid down, but there are several mistakes in
the location of peaks over which the line should pass; for instance, it should cross the
summit of the Cerro de Rincon, but here that peak is shown some distance to the west
of the boundary.

Several small plans of South American ports are given as insets.

Texas.

Hill.

Map of Texas and parts of adjoining territories. Scale 1:1,584,000 or 25 stat.
miles to an inch. Robert T. Hill, 1899. United States Geological Survey, Wash-
ington. *Presented by the U.S. Geological Survey.*

Contour lines in brown, at intervals of 250 feet, are shown on this map, by which
means the relief of Texas is very clearly indicated; the water is in blue, and the
lettering, railways, etc., black. The map is reduced from the surveys made in con-
nection with the United States Geological Survey, and special attention has been given
to the physical features; but as a map for general reference it will be found rather
disappointing, owing to the fact that so few place-names are shown.

GENERAL.**Historical Atlas.**

Putzger.

F.W. Putzger's Historischer Schul-Atlas zur alten, mittleren und neuen Geschichte
in 67 Haupt- und 71 Nebenkarten. Herausgegeben von Alfred Baldamus und Ernst
Schwabe. Ausgeführt in der Geographischen Anstalt von Velhagen and Klasing
in Leipzig. Bidefeld und Leipzig. Verlag von Velhagen and Klasing. Price
2 m. 50 pf.

That this little historical school atlas has reached its twenty-fourth edition is in
itself sufficient guarantee for its general merits and usefulness. It now contains
altogether thirty-seven maps, besides numerous plans and insets, illustrating the history
of the world in ancient, mediæval, and modern times, which are preceded by brief
explanatory letterpress. Germany naturally figures more prominently than any other
country, and the British Isles are only taken into consideration in connection with the
history of the neighbouring countries of Europe; thus, from an English point of view,
the atlas must be considered incomplete.

World.**The 'Times.'**

The *Times Atlas* (new edition), containing 132 pages of maps, and comprising 196 maps, and an alphabetical index to 150,000 names. Published at the office of the *Times*, London, 1900. Price 35s. Presented by the 'Times.'

During the five years that have elapsed since the publication of the first edition of the '*Times Atlas*' in 1895, our geographical knowledge has made considerable advances; regions that were then but very imperfectly known have been surveyed, besides which many important alterations have been made to boundaries. Thus a new edition of this atlas was needed if the work was to be kept up to date, and this has lately made its appearance. The number of maps has been increased from 117 to 132, and numerous fresh insets have been added. The new maps include geological maps of England, Scotland, and Ireland; a general map of the Malay archipelago; one of North-East China and Korea; a fairly large-scale map of the United States and parts of adjacent countries on four sheets; maps of Central and South America, the latter of which is in two sheets; and maps of Australia and New Zealand. These maps form a valuable addition, and in several cases they cancel the small-scale maps of the same countries which appeared in the first edition.

Probably the exigencies of printing have prevented the latest available information being incorporated in some of the maps. In the map of North-East Africa, the surveys made under the superintendence of Colonel J. R. L. Macdonald, R.E., between the upper Nile and Lake Rudolf have not been utilized, while on the same map the Sudan railway is shown only as far as Berber. The Central Asian railways, shown on map No. 81, appear to be somewhat confused, as exactly the same sign is used for the projected railway, which may or may not in years to come connect Kandahar with Herat, as that showing the continuation of the Transcaspian railway from Samarkand *via* Khokand to Andijan and Marghilan, and the branch to Tashkent, which are actually working. In the map of British North America, the important town of Rossland, in Southern British Columbia, should be indicated. In the next edition no doubt there will be an indication of the Crow's Nest railway to the south of the Canadian Pacific main line, as also the boundary between British Guiana and Venezuela, which has now been definitely settled by the arbitration of last October.

On some of the maps an attempt has been made to indicate the ocean depths by contour lines, and the idea so far is commendable, but why select such contours as 27 fathoms, 510 fathoms, etc., instead of even hundreds and thousands, as is usually done? Then again, it is usual, and certainly more natural, to arrange the blue tinting between the contours so that it increases in intensity with the increase of depth of the water, but in this atlas the opposite arrangement is adopted, with a result apt to tend to confusion, at any rate until the eye becomes accustomed to the change. On the earlier edition the more natural system is followed, and the alteration cannot be considered an improvement.

CHARTS.**United States Charts.****U.S. Hydrographic Office.**

Pilot Charts of the North Pacific Ocean for July, 1900. Published at the U.S. Hydrographic Office, Washington, D.C. Presented by the U.S. Hydrographic Office.

PHOTOGRAPHS.**Vesuvius.****Matteucci.**

Four photographs showing Eruption of Mount Vesuvius, May 13, 1900. By Prof. R. V. Matteucci. Presented by Prof. R. V. Matteucci.

These four interesting photographs, presented by Prof. R. V. Matteucci of Naples, illustrate the eruption of Vesuvius in May last. They are as follows: (1) Guide's small house, damaged by the eruption; (2, 3) Showing eruption of Vesuvius; (4) Large piece of rock thrown up by the eruption.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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10. The tenth part of the document is a list of bibliography.

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The Geographical Journal.

No. 3.

SEPTEMBER, 1900.

VOL. XVI.

STUDIES IN THE ANTHROPOGEOGRAPHY OF BRITISH NEW GUINEA.

By Prof. ALFRED C. HADDON, Sc.D., F.R.S.

THESE fragmentary studies on the relation of certain native tribes to their environment are mainly the result of observations made and information collected during the Cambridge Anthropological Expedition to Torres Straits and New Guinea in 1898. Although I am fully aware that they are very imperfect, I have not hesitated to publish these notes, as I think it desirable to call the attention of residents in British New Guinea to the advisability of studying the natives from a broad point of view.

Those who come into contact with varied tribes with different customs and arts and crafts are apt to be somewhat bewildered by the details, and can scarcely "see the wood for the trees." The tribal feuds, too, are often complicated, and have few redeeming features, marked as they are by indiscriminate bloodshed and variable bravery. It appears to me, however, that there is something at the back of all this, if we could only find it out. It looks as if there were slow driftings of various elements in the population along definite lines. This requires investigation and the reasons for these movements should be explained. The vendetta is almost invariably referred to as the cause of tribal war, but there may be other factors besides this.

The direct effect of the country and climate on the people is worthy of consideration, and especially should the fertility of the soil, abundance, or the reverse, of vegetable and animal food, and similar points be noted, as they have far-reaching effects on the people, not only as regards physique, health, fertility, and the like, but also as regards the life of the family and the social organization. For the elucidation of all these

No. III.—SEPTEMBER, 1900.]

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it needs accurate local knowledge, such as resident Government officials, missionaries, and others must possess. If this paper could induce such to put their information into permanent form, I should be well satisfied. I am perfectly aware what many missionaries and Government officials have done to advance our knowledge, but much more remains to be done, and we want more grouping of facts and a deeper knowledge of the motives for actions and of the meaning of ceremonies. I am also perfectly aware that this entails much drudgery, fatiguing work, under very unfavourable conditions, the exercise of considerable patience in collecting and sifting evidence, and, finally, that there will be no reward, save in the satisfaction of advancing knowledge and the preserving of information for future ages that would otherwise be lost to mankind; for it cannot be too often or emphatically reiterated that now is the time to collect and record—soon it will be too late.

After making a few general remarks on the structure of the country and the appearance of the people, I deal in more detail with three distinct regions of British New Guinea. These are the Mekeo district, part of the Central district, and part of the Rigo district. The latter part of the paper gives a summary of our knowledge concerning the geographical distribution of the cephalic index, and of certain selected customs, arts, and crafts, and the bearing of these facts is discussed.

GENERAL STRUCTURE OF BRITISH NEW GUINEA.

The backbone of British New Guinea consists of a long range or series of ranges of mountains running north-west—south-east. The southerly extremity is submerged, and constitutes the Louisiade archipelago; the northerly end passes into the Blücher and Victor Emmanuel mountains, and is continued in a more westerly direction through Netherlands New Guinea to the extreme end of this largest of all islands. Other mountain ranges radiate into Kaiser Wilhelms Land.

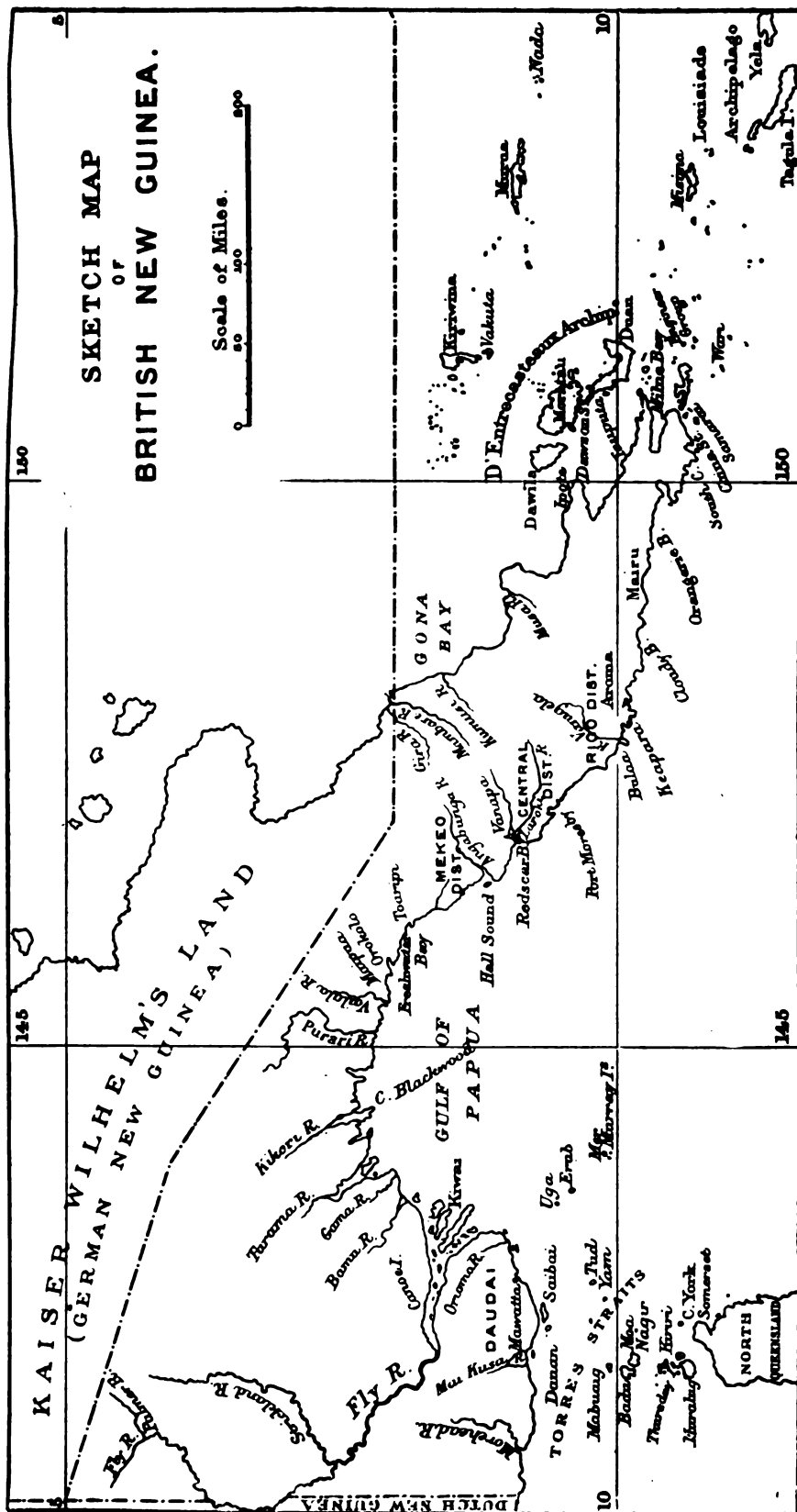
The central mountains appear to be composed of crystalline schists of undetermined age, with slates and gneiss. Flanking these in many places are large areas composed of igneous rocks, such as basalt, ashes, and other volcanic rocks. These constitute broken mountainous and hilly country.

In the Mekeo district there is a narrow coastal band of Tertiary greenish sandy shales, limestones, and calcareo-siliceous beds, which are known as the Port Moresby beds. These form a broader coastal band from Redscar bay to Round head, where they extend into the interior as far as the central schists. As a rule these beds form a broken hilly country, with some mountains of no great height.

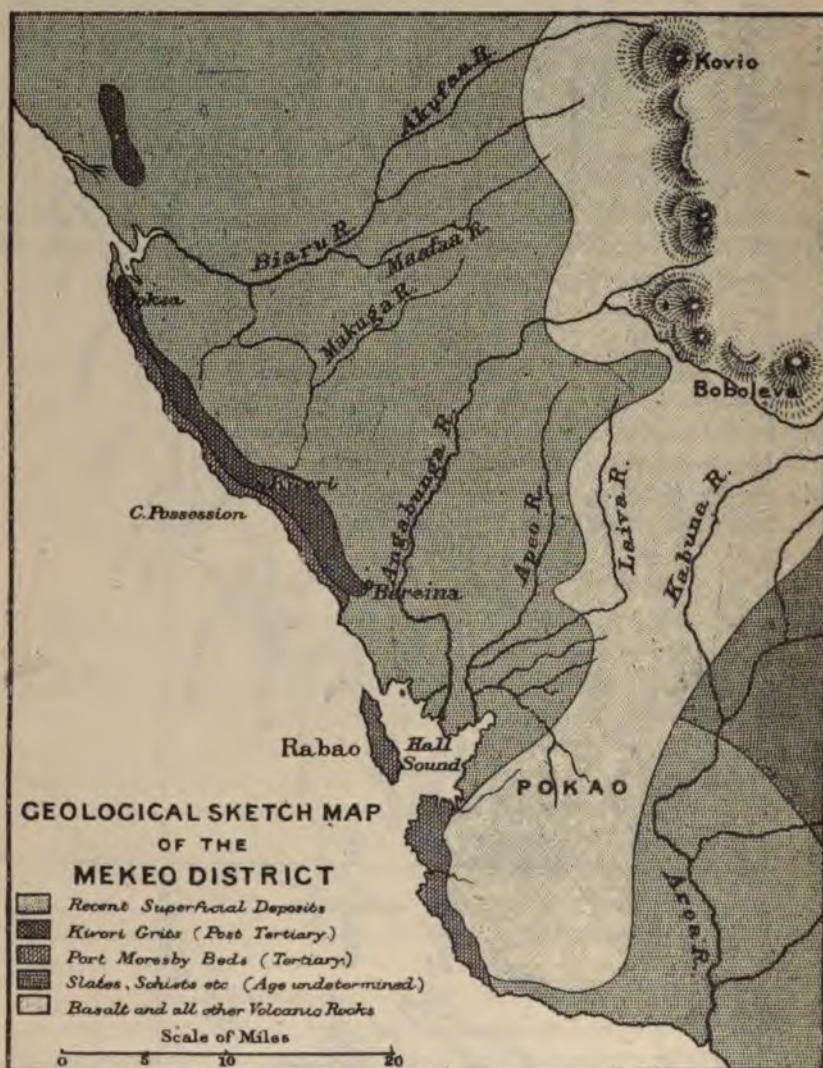
Also in the Mekeo district, from Jokea to Bereina, there is a linear outcrop of Post-Tertiary grits, sandstones, and conglomerates known as the Kivori grits, which runs parallel to and alongside of the Port Moresby beds of this district. They form the low range of the Kivori

**SKETCH MAP
OF
BRITISH NEW GUINEA.**

Scale of Miles.



hills. In a map published by Fathers De Rijke and Jullien,* the Makuga river flows into a large lake, which is called "L. Inapi." I have indicated this in the sketch and geological maps of this district. As



FROM THE MAP MADE BY A. GIBB MAITLAND, ESQ., ASSISTANT GEOLOGIST OF THE GEOLOGICAL SURVEY OF QUEENSLAND. ANN. REPT. BRIT. NEW GUINEA, C.A. 106, 1892.

the lake is not referred to in the Government Reports or maps, I presume it is a morass caused by the Kivori hills preventing the water

* *Comptes Rendus Soc. Geogr. Paris*, 1898, p. 206.

of the Makuga from gaining access to the sea. Probably it is full of water in the rainy season, and then may fairly be called a lake.

Taking the south-east peninsula of New Guinea as a whole, it is composed of a central range of lofty mountains consisting largely of slates and schists, which, so far as is known, have an east-north-east strike. The less lofty lateral mountains, which form occasional *massives*, are composed of acid and basic volcanic rocks, of which the former appear to predominate. To the east these mountains are bounded by contorted Tertiary beds that form a tumultuous hilly country, which extends to the coast-line. Most of the mountains and hills appear to be built up of contorted or much-tilted beds, and may be described as well-dissected folded mountain ranges.

But few extensive alluvial plains occur in the peninsula. The lower reaches of the Laroki and Vanapa rivers and the basin of the Aroa constitute a very fertile plain inhabited by the well-to-do, independent Kabadi tribe, who do a great trade with the Motu potters in exchange for all kinds of native food. The largest of these plains is found in the Mekeo district, and here the natives seem to have advanced further from savagery in several respects than elsewhere on the mainland.

When we turn to the western division of British New Guinea, we find quite a different state of affairs; nothing, however, is known of the greater part of the district. At the German boundary, at the head of the Palmer river, an important affluent of the Fly, are the Blücher mountains, which are about 6000 feet in height; the Donaldson mountains are only about 2000 feet, and are wooded to their summits. At the base of these mountains is a flat alluvial plateau, with low sandstone and limestone hills about 100 to 150 feet in height. South of lat. $5^{\circ} 45'$ S. there are forested steep hills about 500 feet in height; about the junction of the Palmer with the Fly (lat. $5^{\circ} 54'$ S.), the hills vary from about 350 to 400 feet; at $6^{\circ} 5'$ S. they are 200 to 300 feet. From D'Albertis junction ($6^{\circ} 11'$ S.) to about $7^{\circ} 3'$ S., the river-banks vary from 2 yards to 50 feet, but no hills are recorded. From here to the coast is lowlying land, usually densely covered with jungle and often swampy.

This enormous wooded alluvial plain, watered by the Bamu, Fly, Mai Kussa, and Morehead rivers, not counting their affluents and minor rivers, is said to be very sparsely inhabited, and we know extremely little indeed about the natives.

Between the Bamu and the Lakekamu river, which enters the sea at Toaripi, in Freshwater bay, are the Turama, the intricate delta systems of the Omati, Kikori (Aird), and Purari, and the Vailala or Bailala, besides smaller rivers. They appear to be well populated, and there are large and important villages all along the coast inhabited by thriving and energetic people who have plenty of food.

The Australian Cordillera can now be traced from Tasmania in the

south, along the eastern margin of Australia, through the western islands of Torres straits, into Mabudauan hill in Daudai. The eastern islands of Torres straits, Erub, Uga, and the Murray islands, by the recent nature of their volcanic rocks, all of a basic type, belong to a line of later movements.

THE PAPUANS.

The inhabitants of New Guinea belong to that division of mankind which is termed Melanesian, or the dark-skinned, black frizzly-haired people of the Western Pacific.



WAVY-HAIRED BOY, SINAUGOLO, RIGO DISTRICT.

The majority of the natives of British New Guinea are of a rich or dark-bronze colour, but it varies from a brown, that might be called black, to a yellowish brown. The darkest people are confined to the Gulf, the Fly estuary, and Torres straits. Inland tribes at the British-German boundary at the centre of the island are of a light bronze. The tribes on the Morehead, on the upper Purari, and those near Kovio (Mount Yule) are much the same colour as the dark brown of Port

Moresby, and the natives of the central range have about the same colour.

Taken as a people they are remarkably smooth-skinned, hairy individuals being uncommon. Straight or wavy haired individuals are not infrequent in the central and eastern districts and in the islands beyond. In them the hair is often lighter in colour. As many as five per cent. of straight-haired people have been counted at public meetings from the central districts as far east as Gawa, one of the Bennet islands (Kiriwina, Murua, etc.). Sir William Macgregor says, "It has always struck me that the Kiriwina people more nearly resemble the Line Islander * than any other tribe in this part of the world. They have the same mental characteristics, including a tendency to suicide. At Kiriwina, among twenty or thirty boys, there will always be two or three with wavy black hair, which is decidedly not frizzly."† The hair is invariably frizzly among the mountaineers of the central range, and throughout the whole of the western district from the Gulf to the German and Dutch boundaries, and in the islands of Torres straits.

An extremely good general account of the natives is given by Sir William Macgregor in his little book, 'British New Guinea: Country and People' (1897), from which I have not hesitated to borrow facts concerning places I did not myself visit.

NOTES ON THE MEKEO DISTRICT.

In my memoir on 'The Decorative Art of British New Guinea,' I have alluded to the fact that the district between Cape Possession and Hall sound is inhabited by a mixed population, for, in addition to what may be regarded as the indigenous population of the Mekeo district, we find that Gulf natives have migrated from the west, and that Hall sound is the most westerly limit of the immigrant Motu people.

West of Cape Possession are four villages, Kaima, or Oikapu (sometimes called Waikapu, Woikabu, or Oiabu), Jokea, Biar, and Lese.

The Oikapu are a bush people, who more than three generations ago, under a chief named Haisafarui, came down to the coast and obtained such success against the Toaripi that the latter left them in possession of their present land.

The Jokea and Biar folk were originally known as Moaripi, and lived on the banks of the Biar, probably not at its mouth, but within easy reach of the sea. Their language was distinct, and is said to be exceptionally difficult, and is known now to only a few old men. A long time ago, owing to a scarcity of women, considerable intermarriage took place with the Toaripi women, and as a result the Moaripi became a large and powerful tribe, and the men adopted the language of their

* Presumably Sir William refers to the Gilbert group in Micronesia.

† 'Annual Report on British New Guinea,' C.A. 6, 1898, p. 38.

Toaripi wives. They encroached on the land of the Lepu or Sipoi tribe, who lived at Oikapu. This led to continual fighting with varying success, but it would appear that the Moaripi were finally victorious, as



the present site of Jokea was originally Sipoi territory. Jokea was the result of a peaceful split from Biaru.

Sir William Macgregor says * the Jokea and Biaru natives "are of

* 'Annual Report on British New Guinea,' C.A. 35, 1894, p. 18.

the Freshwater bay type—tall men, with long muscular limbs, loosely built, rather dark in colour, with straight, prominent noses. The head is, as a whole, remarkably narrow, the temper impulsive and quick." At Apanaipi, 14 miles up the Biaru river, and at Aipea, a dozen miles further up, the people seem to be of the Mekeo stock. Macgregor records an amusing incident which illustrates the difference in character between the Toaripi type of native and his near neighbour of Mekeo. A family chief of Biaru brought a small pig to present to him, but on the Governor's arrival he began to think it was too little for such a purpose. He put forward another man to say that he was ashamed of the small size of his present, and would not offer it to him, but would go home and fetch a larger one, which he did. The Mekeo man would have presented the little one, if he could not obtain a less.

At the mouth of the Lakekamu (Williams river), beyond Lese, is the important village of Toaripi. The Toaripi are a split from Evara, or Moviavi, which is situated 8 miles from the coast. The migration took place more than a century ago. It is stated that some forty years ago the village site became insanitary, and there was an epidemic of sore legs. Their Motu friends, with whom they trade, persuaded the people to go east, and for a few months they settled at Pari, which is just beyond Port Moresby; but becoming tired of this, they returned to their present village site.*

Father Cochard informed me that the Kaima (Oikapu), Jokea, Biaru, and Lese belong to the Hohoru tribe, who, like the Kivori, are very wild and warlike, and are different from the Toaripi. The latter, who are called Mohu Mohu by the Roro, and Motu Motu by the Port Moresby people, are stated by him to be more traders than warriors. On the other hand, the Rev. James Chalmers† describes the Toaripi as "the terror of all the other tribes from this to Keapara," but he includes under this name "all the Motu Motu villages, Moveave, Lese, and Iokea, and part of Karama." Formerly Chalmers spoke of this as the Elema tribe, which extends from "Oiabua to Orokolo."‡

There is evidence that the Gulf natives were extending in a south-easterly direction until their depredations were stopped by the arrival of the white man, one of their last acts of aggression being to burn the Roro village of Rapa.

East of Cape Possession is the large village of Waima (Maiva of most authors), but formerly there was no village at this spot. The Kivori lived near Cape Possession, and the Roro, Bereina, and Abiara lived on the other side of the hills. These four tribes used to meet at

* For the foregoing information about Oikapu, Moaripi, and Toaripi, I am indebted to my colleague Mr. C. G. Seligmann, who obtained it from the Rev. J. H. Holmes, L.M.S. missionary of Orokolo who was formerly stationed at Jokea.

† *Journ. Anthropol. Inst.*, xxvii., 1897, p. 326.

‡ 'Pioneering in New Guinea' (1887), p. 280.

a particular creek for barter; the Kivori began to build houses at this market-place, and the Abiara followed their example. Hence the double character of the village of Waima, which is further illustrated by the fact that when one of the two tribes has a feast in the village the other does not participate. Still further south-east are the small villages of Roropokina, Roroaiera, and Arabukupuna. Their inhabitants are settlers from Kivori, and were therefore originally Gulf natives, if it is true, as I have been informed, that the Kivori came from further west, perhaps from Orokelo.

At the southern point of Hall sound is the village of Delena, the more correct name for which, I was informed, is Marihau. The founders of this village migrated from Port Moresby, and mainly occupied the slopes of the hill. These people are largely adherents of the London Missionary Society. A part of the village of Delena on the sand-beach is called Roro, and the inhabitants are said not to be so amenable to missionary influence.

The Roro originally inhabited Oriki, near Bereina, but they were driven away by the Bereina and Waima, and they settled at Ahara, on Rabao (Yule island), which was then uninhabited, and at Marihau (Delena). From Ahara the people migrated to Pinupaka, but they still bury their dead at Ahara. In order that the spirit of the dead may not be offended that the corpse is not buried at Pinupaka, the friends tell the dead body that it is not being buried in the bush, but in the village, and that they, the living, have left the village and gone into the bush.

To the south-east of Delena is the inland village of Oro, usually called Nara. The people are essentially the same as the Pokao; they have the same kind of houses; they meet in feasts, and intermarry. There are two colonies from Waima, near Oro: (1) at Nabupaka—these were a branch of the Abiara tribe; and (2) at Biziu (Bitshiu, or Isiu). These villagers have the same language and customs as those of Waima. The Waima folk bought the latter site from the Kabadi people, and paid for it in native trade. The Rev. H. M. Dauncey informs me in 1891 there were very few houses there, but since 1894 the place has steadily grown by settlement of fresh Waima families.

There is not the same intercourse between the Marihau of Delena or other villages to the south-east, who are also of Motu descent, and the Mekeo peoples, as between the latter and the coastal population of the Papuan gulf. Proof of this is evidenced by the fact that the Kivori, Waima, and Roro know the Gulf villages and visit them for feasts, but they never go to feasts at Kabadi, Redscar bay, or Port Moresby. A few visitors come from Oro (Nara) or Pokao, to feast at Bereina or Waima.

There are three main groups of people in the region round Hall sound, which are distinguished by marked dialectic differences. These are the Roro, Mekeo, and Pokao.

Roro.

The Roro plant their villages on the sea-shore and along creeks. The men live as much in their canoes as on their infertile soil. These fishermen collect in large numbers at the fishing seasons at the mouths of the Angabunga, Apeo, and other rivers. The fish are carefully smoked, and are bartered for the fine taro and enormous sweet potatoes grown by the Mekeo women. According to the seasons with their prevailing winds, these adventurous and trafficking mariners visit the coastal tribes to the north-west or to the south-east. In the Papuan spring, October and November, they repair to Toaripi for sago, which grows in inexhaustible quantity in the neighbourhood of the great rivers. Here they exchange the thin pots of Ziria, the main village of Rabao (or Yule island), which are celebrated all along the coast, for bundles of sago, which are stacked in the bottom of the trading canoes, the latter being four or half-a-dozen canoes lashed together. In March or April, after the heavy rains, the annual visit is paid to the jewellers of Taurama and Pari, who excel in the manufacture of necklaces of small shells (*mobio* = *taotao* (Motu)) and of polished shell armlets (*ohèa* = *toea*, (Motu)).

The art of pottery-making was introduced into this district by immigrants of the Motu stock, who, as we have seen, have reached their furthest western limit at Delena. Not very long ago only one woman at Pinupaka had acquired this art, now all the women practise it, but the clay is obtained from Yule island.

These merchant fisher-folk have the reputation of being roguish and cajoling, and with a pretty conceit in flattery. When boats arrive they are greedy for news. They have been described as the Athenians of Papua. Their language compares favourably with the guttural tongue of the inland folk, being clear, musical, and distinct, with neither strain nor ridiculous contractions.

Mekeo.

The Mekeo group of people live mainly in the villages that cluster around the Angabunga (St. Joseph) river; there are also villages on the upper waters of the Biaru, and on the Apea, Laiva, and other streams that flow into Hall sound near the mouth of the Angabunga. They are an intelligent, interesting, and well-to-do set of natives, who present marked differences from their Gulf neighbours. There are two great divisions, the Vee and the Biofa. The prolific and skilful Biofa have devastated the villages of the Vee, and, according to the Sacred Heart missionaries,* they have also strengthened themselves by alliance with "the sea-warriors, Lokou and Motu-Motu" (Toaripi), in order to crush their rivals. Unfortunately, I have no further information to give

* Album des Missions de la Nouvelle-Guinée. Pèlerinage de Notre-Dame du Sacré-cœur, à Issoudun.

concerning these two factions, and it would be important to trace out the history and significance of this feud; it rather looks as if the Biofa were an immigrant tribe that was depossessing the indigenous Vee. I regret I cannot mention which are the Biofa and which are the Vee villages. It is, however, a matter of recent history that Eboa has attacked Inawabui, and later Inawaia followed their example; but these feuds have now been settled by the Government. Inawa, an offshoot from Inawaia, is (according to Macgregor) the smallest and fiercest tribe in this part of the district. The late Bishop Verjus urged the Inawaia and Eboa to cease their quarrelling, and prevailed on them to build a new village on the left bank of the Angabunga, in which the Vee and Biofa were to live amicably side by side. He named this village "The Peace of Jesus," *Jesu baibua*, or *Yeku ngangau*, according to two local dialects. The village is generally termed officially Yeku.

The Mekeo people are good agriculturists, and their rich soil yields them abundant harvests. Each of their villages consists of a single wide street, with houses on each side; sometimes the houses are two or three deep, but in this case they are not so arranged as to leave a regular street on each side of and parallel to the main street. There are usually two *mareas*, which are generally placed at opposite ends of the village. The *marea* is the club-house of the men; often it is highly decorated with carved and painted posts and boards and streamers of palm leaves. The *marea*, which is the equivalent of the *erabo* or *eramo* of the Gulf, the *kwod* of Torres straits, and the *dubu* of further east, is the centre of the social, political, and religious life of the men.

The Government has had very great difficulty in getting the people to bury their dead in a cemetery away from the village, as they preferred their old plan of burying under the houses. The people are greatly in dread of the sorcerers, who have the reputation for very powerful magic.

Pokao.

The inland district south of Hall sound is a dry hilly country, with sparse woods and green swards, where grow the aromatic plants so dearly prized for personal wear by the natives of the whole district. The physical conditions of this healthy land of eucalyptus and kangaroos do not appear to be favourable to agriculture, and so the inhabitants have become mainly hunters of the abundant game. On referring to the geological sketch-map, it will be seen that this is a region of old volcanic rocks.

The Pokao people are an instructive example of the economic defects of a hunting existence. The necessity for getting fresh food every day—for meat cannot be kept like yams or sago in this tropical climate—fosters improvidence. Hence these hunter-folk are too lazy to send their meat to market. If the Mekeo people will fetch the meat they

require, so much the better; if not, to use an expression employed nearer home, they "can't be bothered."

A hunting population, all the world over, is liable to periodic famines, and the Pokao people are no exception; but so ingrained is their laziness, or indifference, that they have been known to refuse to send for food which they could have had for nothing. They preferred to go hungry rather than take a monotonous tramp to obtain food.

Probably in no part of British New Guinea are markets so numerous as in the Mekeo district. As markets are important factors in the social evolution of a people, it would be well if some of the residents in this district were to make a special study of the origin and regulations of the various market-places.

Markets are held at Inawaia and Mohu every five days on the banks of the river, and at various intervals at Inawi, Inawa, and Jesu Baibua, to which the Bereina, Abiara, and Waima people come. During the crab and crayfish season in the north-west monsoon, these markets are also held every five days. Inawi and Inawa used to fight Bereina, and trouble consequently often arose in the villages on market days. To lessen this danger, the Government appointed a market to be held in the forest between Inawa and Bereina. Roro has no regular market, but there is a great market at the mouth of the little river of Oriki, near Abiara.

According to the physical features of the locality, the villages have a superfluity of some food, or have access to a speciality, or are experts in a handicraft; these naturally form the stock-in-trade. For example, the Roro of the coast from Pinupaka, Rabao (Yule island), Marihau (Delena), and even the villagers of Nabuapaka beyond Delena, trade crabs, crayfish, and mussels, as well as pottery for the taro, yams, sweet potatoes, sago, bananas, and areca nuts of the Mekeo tribes as far inland as Rarai, at the foot of Kovio (Mount Yule). Waima trade in coconuts; Waima, part of the Kivori, Bereina, and Babiko provide yams and some sago. If a big feast is approaching, the Mekeo people send for wallabies and cassowaries to the villages of the rich game district on the other side of Hall sound, such as Pokao, Boinamai, Nabuapaka, and Biziu. Even the Waima and Kivori and Bereina will send to Pokao for game, although wallabies are obtained in the grassy plains around Bereina; sometimes they get game from Kaima.

The natives of Rabao (Yule island) buy nose and arm and other shell ornaments from the Port Moresby villages, Pari, etc.; feather ornaments, gourds, and forks from Mekeo; petticoats from Kivori; and large bark belts from Toaripi.* The bows of the district are mainly manufactured at Kaima.

* I believe these are plain bark belts; the Toaripi men obtain the carved bark belts which they wear from Vailala and Orokol.

NOTES ON THE CENTRAL DISTRICT.

In order to give a clear idea of the social condition of the inland tribes, I must briefly recapitulate the principal physical features of the country. The main range of mountains runs some 40 miles from the coast and roughly parallel to it. Eight miles north of the 9th degree of south latitude, the Owen Stanley range culminates in Mount Victoria, the highest mountain in British New Guinea (13,121 feet). A pass (the lowest part of which is 6500 feet above sea-level) occurs about 4 or 5 miles south of lat. 9° S.; it is known as "the Gap." The central range of mountains is very fertile, whereas the ranges of hills and mountains to a distance of about 15 miles from the coast in the neighbourhood of Port Moresby are, comparatively speaking, barren. The broad belt of densely wooded, broken country between the coast ranges and the main range is also very fertile. Atsiamakara—the Taburi village that we visited—is just at the inner boundary of the relatively barren coast ranges.

At various spots along the coast—as, for example, at Port Moresby, Gaile, Kapakapa, Bulaa, Keapara, etc.—there is a maritime population of fisher-folk, who are obviously an immigrant people. Sometimes these have effected a lodgment on the land, and may, as at Bulaa, possess a small tract for gardens; and there is often friction between the fishermen and the autochthonous agricultural coast population. In Port Moresby the two peoples live together amicably, the fishing Motu living in one part of a village, and the agricultural Koitapu in another. The former look down on the latter, but at the same time fear the power of their sorcerers, and propitiate them when they require a fair wind for sailing or good weather for fishing. Other examples are known of a dominant people being dependent upon the magicians of the people they have conquered. Various combinations have occurred in the recent history of British New Guinea for aggression and reprisal along the coast; but, speaking generally, these two groups are usually opposed to one another.

Probably owing to their rich soil and fine climate, the mountaineers of the main range have a splendid physique, and are fine hardy men. They hunt the wild pig and other animals, but they are great gardeners, and have large plantations of indigenous sugar-cane, as well as of yams, sweet potatoes, and bananas. There is a superabundance of native food, and tons of it may be seen left to waste. Excess of food means plenty of leisure, and the energy begotten by such a country and good food must have an outlet. Naturally the people take to raiding their neighbours, and consequently there is a continual pressure, as it were, from the mountains towards the coast. It might be supposed that the intermediate belt of fertile hilly country would produce men strong enough to withstand the main range mountaineers, but it does

not, and the reason appears to be that there is no inter-tribal combination. The villages are usually small, from half a dozen to eighteen houses, and generally situated on the top of a steep hill or ridge. Many of them have tree-houses as places of safety, and quite a number, especially those towards the interior, are stockaded. The stockades may surround a village, or occur only as a close fence at each end, the object of which is to prevent the village from being rushed. Usually there is on the top of the stockade a projecting platform slanting upwards, up which the besieged rush to throw spears at the enemy.

Round about "The Gap," in the main range, five powerful tribes, Baura, Agi, Manari, Hagari, and Efogi, a few years ago entered into a sort of confederation, but only for aggressive purposes. A native, in



THREE GAILE NATIVES: MOTU STOCK.

describing this, illustrated his meaning in the following way: he was chewing sugar-cane at the time, and he gathered up the dry fibres into a heap, and then scattered them apart to express the dispersal of the tribes after a foray.

This confederation has harassed an extent of country that cannot be less than some 50 miles in length and 30 miles in breadth; over a large tract of this area the country has been depopulated and numerous villages entirely destroyed. The intermediate country being thus subjugated, the confederation had commenced operations quite close to the coast, when it was broken up by the Government; but it does not appear that even now the Hagari have been properly reduced, though their influence has been diminished.

The hill tribes of the interior have also played a similar game on the coast tribes. There was little to choose between them and the main range tribes, except that the latter were the more powerful.

A brief account of some recent history will illustrate the seethings that take place in a savage country, and the difficulties which a civilized government has to contend against.

In 1884 an expedition was despatched by the *Age* of Melbourne to explore in British New Guinea under the leadership of Mr. G. E. Morrison. He had not proceeded far up the Goldie river (the main upper affluent of the Laroki) when he came into conflict with the natives. A large part of his outfit fell into their hands, and he returned to Port Moresby severely wounded by a spear. His assailants were the Varagadi or Ebe tribe. It was an unfortunate occurrence both for Mr. Morrison and for those that followed him, as his expedition undoubtedly created in the minds of the Ebe people exaggerated ideas of their own prowess, and a desire for plunder at the expense of the traveller or others not able to defend themselves.

Three years later Dr. H. O. Forbes led a Government expedition into this district, but he had the misfortune to come into contact with the Ebe tribes that had driven back Morrison, and, further, to impinge upon the more remote fighting tribe of Baura. It was impossible but that the expedition of Mr. Morrison should increase the risk to which Dr. Forbes's party was exposed; but this risk was very greatly increased for future travellers by the expedition of Dr. Forbes—not only was the hostility of the Ebe or Eburi confederation confirmed, but the more powerful and warlike Baura tribe were animated with analogous feelings. The then Government took no steps to quiet the district, and, as a result, for several years there were murders and raids of the stronger tribes upon their weaker neighbours. After one abortive attempt to arrest some of the ringleaders in 1893, a punitive expedition made a descent on the Varigadi tribes, but did little more than chase them across the Vanapa river and secure a few prisoners. The country still remained unsettled and unsafe.

Towards the end of 1896, Alaise S. Anthony—a coloured man who collects natural history specimens for Rothschild—organized an expedition from Port Moresby to the gold-workers on the Mambare river, on the other side of the main range. He reached the Baura country, and for four days tried to get carriers to transport his baggage further inland. The natives refused, and, to show their unwillingness, cleared off into the bush. In the middle of the night of November 3, a Loyalty islander, named Willy Lifu, who was one of the "shooting boys," said he felt hungry, and foolishly left the others and made up a fire to roast a couple of yams; whilst doing so he was speared through the leg. The camp was roused, and a good deal of indiscriminate firing took place into a stockade at one end of the village and into the bush, though

no further attack was made by the natives. The party bolted next morning, leaving behind them nearly all their baggage and trade, including a Winchester rifle with the magazine full of cartridges. On the way back another collector named Rochfort strayed from the main party, and was bushed; fortunately, he was shortly afterwards rescued by Mr. Ballantine.

About the same time the Wamai joined the Uberi in a raid on Awaiatenumu, a village of the Gasiri tribe situated about 15 miles from Port Moresby. The Hogeri (Sogeri) intermarry with the Uberi, but they did not take part in this particular massacre. This tribe has been visited by very many travellers, and was known to the members of the London Missionary Society twenty years ago. Mr. Ballantine, a Government officer, went out to punish the Uberi. The difficulty in all such expeditions is to get at the men; forced marches have to be made through unknown and usually very difficult country, and care has to be taken not to give the alarm. The most frequent plan of attack is to surround a village at night, and then rush it; but often warning has been given, and the village is found to be deserted. It not unfrequently happens that when a village or plantation is rushed, all the men escape, and a woman or two, with perhaps one or two children, are captured. These are invariably well treated, and are employed to open negotiations with the men by shouting out to them, and voices from the bush sing out in reply. It is surprising to what a distance these bush people can call to one another by employing a far-carrying sing-song intonation. There is also the language difficulty. On one quieting expedition Ballantine took with him a series of five interpreters, and the information had to be conveyed in this roundabout manner. If it is difficult to get the truth from one Papuan, how much more must it be through the intermediary of five!

The Uberi people were very difficult to get hold of, and for a long time they would not submit; Ballantine had to visit them five times before they became thoroughly amenable. During this time large parties of police and bearers had been knocking about the Uberi territory, living on their gardens and chevying the men from place to place. In order that the police should have no shelter, the Uberi burnt their own villages, amongst which was the village of Ube, with its eleven newly erected houses. Only two Uberi men had been killed and two captured, but the tribe had been well punished, there was not a house left standing belonging to it, and they were by this time short of food. When they finally submitted, they sent for a shirt for their chief to wear, in order that the other tribes might see that they were now at peace with the Government. The chief's shirt is now the recognized symbol of loyalty in this district.

In 1897, five men, five women, and two children of the Uberi were massacred by a combination of the Baura, Agi, Hagari, etc. The Uberi

chief, Inawe, stated that the Uberi had always been subject to be raided by some of the Baura confederation, although they used sometimes to join the rest of the confederation to attack others. After the Awaiatenumu massacre, the frequent visits of the police had compelled them to leave their own district and go further inland, where they made new gardens. It was here they were attacked by the confederation.

The Uberi tribe is now quite friendly to the Government, and has asked to be put under its protection against the Baura confederation. They had themselves experienced the strong arm of the law, and now they were glad to be under its protection, and to let their hereditary enemies undergo a similar experience.

In the latter part of 1896, some 150 to 200 Hagari warriors made several raids on the Varigadi (Waregare, or Boregade) natives. The Hagari live on the southern slopes of Mount Service. So far as I can make out, three were killed in September, nine in November, five in the middle of December, and seven later in the same month. Kadavi, the chief of the village of Bohula, appears to have been the instigator of these massacres; to use the expressive characterization of him by a native, "his inside was like fire." He sent three men on ahead to cut a road through the bush to Varigadi. On their return there was a big feast at Bohula, where the fighting men from six villages had collected preparatory to starting on the raid.

Commandant Butterworth, who led the punitive expedition against the Hagari, took Bohula, their principal village, and secured one man, one woman, and four children as prisoners; one Hagari man was shot. The captured man had been induced to approach to receive a present, and was then seized and made a prisoner. He was taken to Port Moresby where, unfortunately, he died; the others were released when the village was left.

The Hagari fathers were greatly excited about the fate of the captured children, and were immensely relieved when assured by the woman of their safety. In spite of the invitation of the woman, the men would not come near the police camp, but shouted out in defiance, "The fish swim underneath, the birds fly above, but you have only one road. Dance, sing, eat our pigs; but how do you expect to return?"

The commandant replied that he would go back on the following day, and defied them to do their worst.

The Papuan warriors are certainly as great at boasting and bluff as were the Homeric heroes or the ancient Irish champions, but when it comes to blows they are often sadly deficient. Needless to add, Commandant Butterworth was not attacked, though a few spears were thrown at intervals at his men as he marched back to Port Moresby.

The unfortunate village of Awaiatenumu, which has five houses on the ground and six tree-houses, was attacked at daybreak on July 16,

1897, by the Baura-Agi confederation. The enemy arrived close to the village, and, being distributed into three bands, rushed from different directions down the hill through the plantations, leaving in their track three lanes of fallen banana and paw-paw trees. All the women and children had passed the night in the tree-houses, the men and lads sleeping below. On hearing the raiders rush through their gardens, all those on the ground scurried up the ladders to seek safety in the tree-houses, with the exception of two boys, who took shelter in a grassy



TREE HOUSE, GASIRI, CENTRAL DISTRICT.

patch, where one of them was caught and killed. All the men escaped injury except the last, who was speared in his right ear and in the thigh and leg as he was mounting a ladder. The enemy stayed in the village till mid-day, and then retired.

It seems obvious to us, if murder and plunder were the real objects of these forays, that nothing could be easier than to cut down the trees that support the tree-houses after the refugees had hurled away all the spears and stones which they store in these houses for such emergencies.

This is not, however, the fashion of native warfare, and, insecure as they appear to us, these tree-houses are real refuges. The mountaineers carried no clubs, but had spears and some tomahawks and half-axes which formed part of the trade forsaken by Anthony's expedition. The Baura men had rehatted the axe-heads on to long handles to make them more effectual as battle-axes.

This attack on Awaiatenumu was quite unprovoked, but the confederation, having swept all the intermediate country, was extending its operations, and even had the temerity to come within a short distance of Port Moresby. The district inhabited by the Ebe, Bereka, and Varigadi has been completely depopulated by the Wamai, Baura, Hagari, and other tribes near the Gap. The few survivors of the first-mentioned peoples have thrown in their lot with the Uberi, while some of the Varigadi are still on the Vanapa river.

NOTES ON THE RIGO DISTRICT.

The Rigo administrative district extends, I believe, from Gaile (Kaile) to Cloudy bay. We did not get beyond Keapara.

The ethnology of the country inland from Round head is somewhat complicated. People said to be of the Motu stock occupy the coast. The village of Kapakapa was formerly a purely marine village, but, like Lakwaharu (Tupuseleia) and Gaile, the inhabitants are also building on the shore. Sir William Macgregor encouraged this departure; but Mr. A. C. English, the very efficient Government agent for the district, states * that it is regrettable from a sanitary point of view, as the natives are far cleaner and healthier in their villages built over the salt water. He also informs us † that the natives of Lakwaharu have no record of occupation, but that they are the aboriginal owners of the land. If that be so, one fails to see why they built their village in the sea, unless, indeed, they had been driven there by a stronger people from the interior. It is only in recent years that the people of Gaile have worked in their gardens without constant fear of attack by neighbouring tribes. Three typical Gaile natives are figured on p. 279.

The Ikoro tribe live in a narrow zone which extends only a mile or two from the coast; the villages of Komata, Tagama-Keketo, Palavain, and Gaboni belong to this tribe. Behind these again are the Sinaugolo villages of Iruagoro (the chief village at Rigo), Babaka, Kopogoro, Saroa, and the new village of Gomori Dobo—this is near the Government station, which is perched on a small hill called Kupogolo or Kukogolo. Much further inland, on the Vanigela river, is the Sinaugolo village of Kaliko Dobo.

Inland from the chief Sinaugolo villages are Gerese, Gini Ikula (or

* 'Annual Report on British New Guinea,' C.A. 35, 1894, p. 53.

† C.A. 93, 1894, p. 64.

of the Ikoro, and the forward movement is still taking place, as the Sinaugolo have migrated 3 miles nearer the coast during the last ten years. A Sinaugolo boy with wavy hair is figured on p. 270.

The second and later invasion from the interior started from Governor Loch range, and was that of the Garia tribe. They went southward, and on striking the Musgrave and Hunter rivers they travelled down their valleys, then crossing other affluents of the Vanigela (Kemp Welch river), they stopped at the hills behind the Government station of Rigo. The Garia have thus migrated across the path of the Sinaugolo, and in many cases they occupy the sites of old Sinaugolo villages. I am indebted to my colleague, Mr. Seligmann, for this information about the Sinaugolo and Garia tribes, and he in his turn obtained it from Mr. English.

The Hood peninsula has evidently been formed mainly by the Vanigela. It is a low, level spit of sea-sand and alluvium brought down by the river, which has been deposited in the salt water, and then heaped to leeward by the indirect action of the prevailing south-east wind. This combination makes a light, fertile soil. A considerable part of the peninsula consists of grass land, with scattered screw pines (*Pandanus*) and small trees, with here and there a few cycads; occasionally there are patches of bush or jungle, and groves of coconut palms. There are also numerous gardens, which the natives keep in beautiful order.

The peninsula is divided into five lands, belonging to the Kalo, Kamali, Babaka, Makirupu, Oloko, and Diriga people. The last three villages were so decimated by sickness some three generations ago that there were few survivors, and the smaller numbers that still remain have recently been driven to Babaka by the Bulaa. The Bulaa people have planted many coconuts on the land, but the greater part belong to the three tribes mentioned. The Bulaa people now claim the land, and this has naturally been the cause of friction, as the Babaka and Kamali people resent this encroachment. The Government has taken the common-sense view, and recognized that it was necessary for Bulaa to have garden-land, and as the Diriga land, which lies at the end of the peninsula, is practically unowned, the Government has had it surveyed and given Bulaa legal possession. The Kamali state they have been in occupation for ten generations, and that the land was unoccupied at the time of their first settlement on it.

The village of Bulaa, or Hula, as it is generally called, consists of four groups of pile-dwellings in the sea, each group having its distinctive name. The Bulaa people have occupied this shore for about thirty-eight years only. Formerly they lived in the village of Alukune, or Harukune, which is adjacent to Keapara (Kerepunu). For generations the former have been subservient to the latter, who have been in the habit of levying toll from them in the shape of fish and other

marine produce. The Alukune possessed no land, and were not allowed to acquire any, though their masters of Keapara had more than enough for their own wants. Vegetable food being a necessity, they bought it from Keapara, giving fish in exchange, which Keapara, being the stronger tribe, were able to obtain at a very cheap rate. They were not only oppressed in this and other ways, but their women were seized and taken as wives by Keapara men. Half of the village, driven to desperation by the oppressions of these people, left in a body and settled at Hood point, and built the village of Bulaa. The other half who remained were still held in subjection by Keapara, and their condition was but little improved since the old days until very recently, and even now they do not appear to be in a happy or thriving condition.



VILLAGE OF KALO.

Although the inhabitants of Alukune are fisher-folk, they obtain their canoes from Keapara, and for these they pay heavily. I was told it was half the catch, in other words, they traded on the half-profits system. I believe a canoe debt is rarely cleared off.

Canoe-making is the great industry of Keapara, and it is an unusual sight in New Guinea to see men constantly actively at work, and to hear the rhythmic chops of the stone adzes hollowing out one or two canoes at a time. The sense of smell is also affected, not only by the smoke of the fires that are lit outside and inside the canoes, but also by the very disagreeable odour given out by the soft wood as it is chipped by the adzes.

The Keapara folk have always been somewhat turbulent, and have often stimulated Kalo to oppose the Government. Keapara trades marine produce with Kalo for garden produce, but I am not sure how far it is Keapara proper or Alukune. The Kalo people are so well off and think so much of themselves, that they make no advances to Keapara, and, instead of meeting them part way, and so forming a market-place as is done in the Mekeo district, they force the Keapara women to trudge round Hood bay in order to trade in the village square of Kalo.

Kalo has an important situation at the mouth of the Vanigela river, as it can command the trade between the interior and the coast. Feathers and feather ornaments, grass armlets, boars' tusks, bamboos, trees for canoes, building materials, are retailed to the coast tribes, and fish, shell-fish, shell ornaments, and the like are traded in exchange. The soil about Kalo is very fertile, and produces abundant crops of coconuts, areca nuts, bananas, yams, sweet potatoes, and the like. As the inhabitants have the trade of the important Vanigela river, and can supply all their own wants by themselves, they have become a rich and powerful people; indeed, Sir William Macgregor regards Kalo as the wealthiest village in British New Guinea. The village is remarkable for the strength and size of its houses; some of the hard-wood piles on which they are built are of very considerable thickness and of great height. We measured some 18 inches in diameter, and 30 feet in height. Many of the planks used in flooring the houses and platforms or verandahs are of wonderful size, especially when one bears in mind the imperfect tools by which they are made. The wood employed is so hard that boards are handed down from father to son as heirlooms, and the house-piles last for generations unless burnt down.

The story of the massacre of mission teachers in 1881, at Kalo, at the instigation of the chief, is told by the Rev. James Chalmers, in 'Work and Adventure in New Guinea,' and in 'Pioneering in New Guinea' he gives an account of how the massacre was punished and the chief lost his life.

THE GEOGRAPHICAL DISTRIBUTION OF THE CEPHALIC INDEX IN BRITISH NEW GUINEA.

I have tabulated all the information that has been published concerning the craniology of British New Guinea, together with the observations on skulls and on the living made during our recent expedition; but I propose giving only the conclusions at which I have arrived; the details will be published elsewhere. I would like to take this opportunity of thanking Mr. Seligmann for allowing me to in some measure anticipate the results of his personal investigations.

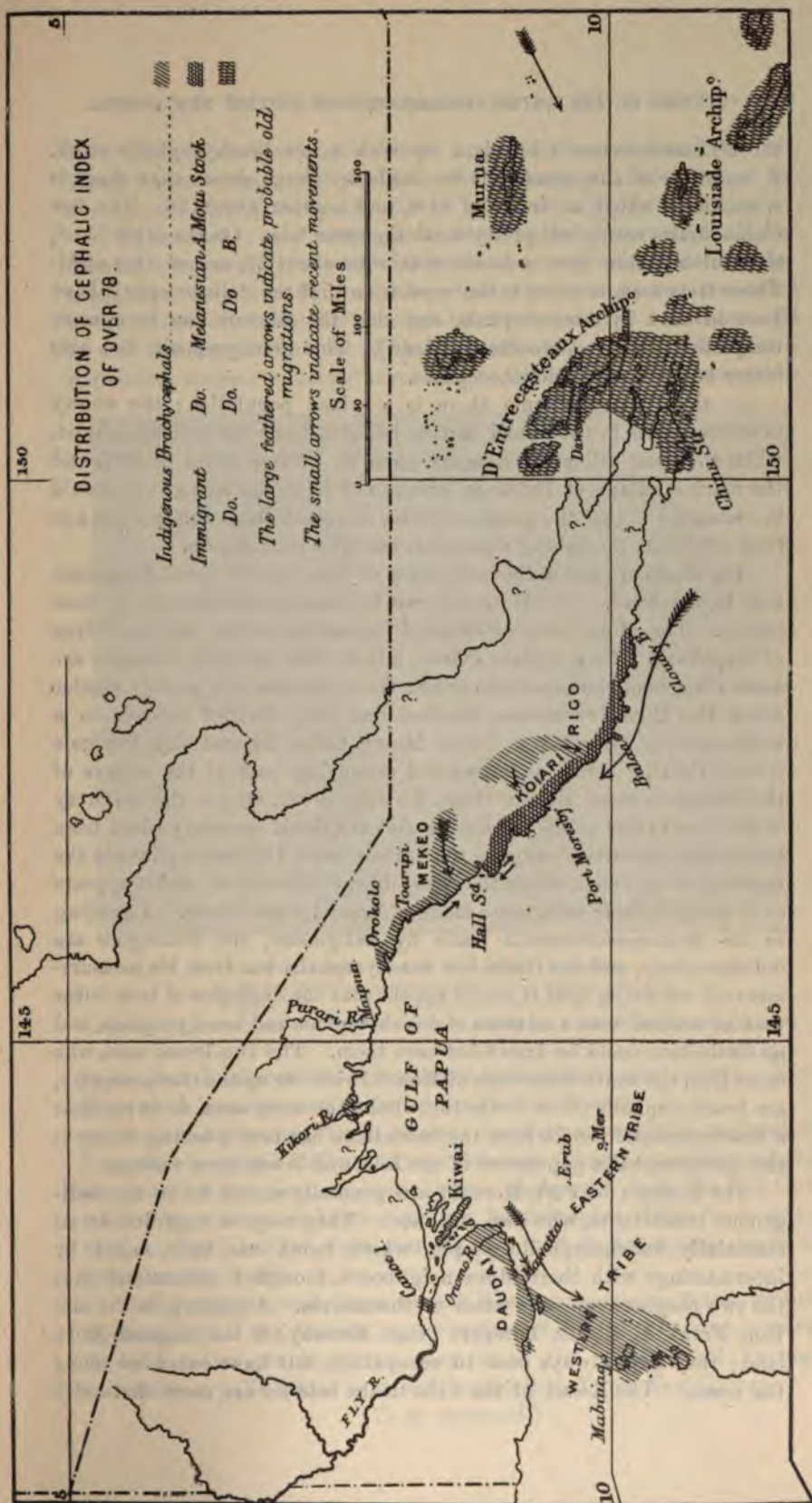
A consideration of the available data brings out the fact that a dolichocephalic population is present practically everywhere, so far as is known, in the British possession. In the China straits district and in

DISTRIBUTION OF CEPHALIC INDEX OF OVER 78.

Indigenous Brachycephals	Do.	Melanesian-A Motu Stock
Immigrant	Do.	Do. B.

The large feathered arrows indicate probable old migrations

The small arrows indicate recent movements.



the d'Entrecasteaux it is mixed up with a low brachycephalic stock. A seriation of the measurements made by Sergi shows that there is a maximum about an index of 71.5, and another about 78. The few China straits crania tell pretty much the same tale. On the other hand, the Murua crania have a feeble maximum about 77, and another at 81. These facts seem to point to the conclusion that the dolichocephals have been invaded by brachycephals, and that the mixture has been more complete in Murua (Woodlark island). The brachycephals had also larger heads than the dolichocephals.

In the Hood peninsula there is a mixed population; the scanty evidence points to the inland natives being more or less dolichocephalic, while the coast village of Keapara gave an average index of 80.7, and the marine village of Bulaa an average of 82 in the living. It should be remembered that the people of Bulaa migrated about thirty years ago from Alukune, the fishing village associated with Keapara.

The Ikoro are the indigenous tribe of the district about Kapakapa and Round head. Unfortunately, we have no measurements of these people. The Motu have established themselves in the marine village of Kapakapa. To a certain extent, mixed with the Ikoro villages, are some villages of the Sinaugolo tribe; their villages now mainly cluster about the Rigo Government station, but their district extends in a north-easterly direction as far as Mount Giles, beyond the Vanigele river. Cutting across this area and occupying part of the valleys of the Musgrave river, Hunter river, Nutmeg creek, etc., is the territory of the Garia tribe. The Sinaugolo and the Garia certainly came from the interior mountain ranges; the former were the first to invade the territory of the Ikoro, whom they have driven before them, and it appears as if they, in their turn, were being pressed by the Garia. According to the skull-measurements made by Seligmann, the Sinaugolo are dolichocephals, and the Garia low brachycephals, but from his measurements of the living head it would appear that the examples of both tribes that he studied were a mixture of dolichocephals and brachycephals, and no distinction could be drawn between them. The two Irumi men, who came from the south-west slope of Mount Bride, far up the Garia country, are brachycephalic (81.9). On the whole, the facts seem to imply that a brachycephalic people from the mountains has been pushing before it the dolichocephalic population of the hills and lower river valleys.

The Koitapu of Port Moresby are generally stated to be the indigenous inhabitants, who own the land. They may be regarded as an essentially dolichocephalic people, whose index has been raised by intermarriage with their Motu neighbours, though I understand that the two peoples keep very much to themselves. According to the late Hon. Frank E. Lawes, Porepore (Port Moresby) is the original Motu land; they have always been in occupation, but have extended along the coast. The Koiari of the hills in the interior are more distinctly

dolichocephalic. The mountaineers appear to be low brachycephals. Those whom we measured were, like the Koitapu and Koiari, below the average in height, having a stature of 1.607 metre (5 feet 3½ inches).

I do not find it easy to suggest an ethnological history of the Mekeo district. Apparently, a people of the same stock as the low brachycephalic mountaineers descended from the mountains and took possession of the fertile alluvial plains watered by the Angabunga and Biarua. It is true that very little trace of the supposed indigenous dolichocephalic population appears to persist according to the head-measurements taken



KOIARI MEN OF THE VILLAGE OF MAKABIRI.

A. Maraga (the chief), height 1692 (5 ft. 6½ in.), cephalic index 77.2.
B. Meyu „ 1657 (5 ft. 4½ in.) „ „ 70.

TYPICAL BEARDED PAPUANS OF THE CENTRAL DISTRICT, WITH SPIRALLY COILED HAIR.

by me, but I suspect that this element does occur to some extent. The Motu stock has advanced as far up the coast as Delena.

Fathers Jullien and De Rijke state that the natives on the mountains immediately behind Hall sound, the Boboleva (Mount Davidson) range, are quite distinct from the coast tribes. Seligmann finds the Uni Uni folk of the village of Emene are low brachycephals (min. 73.5, max. 81.7, av. 78.6), but the eight men he measured do not appear to be a homogeneous group.

Still further inland, these Sacred Heart missionaries found on the upper waters of the Alabule (upper waters of the Angabunga) another type of native, evidently an example of the convex-nosed Papuan ("Semitic type"), which is so widely distributed over New Guinea.

(To be continued.)

KING MENELEK'S DOMINIONS AND THE COUNTRY BETWEEN LAKE GALLOP (RUDOLF) AND THE NILE VALLEY.*

By the late Captain M. S. WELLBY, 18th Hussars.

BEFORE speaking of my travels beyond Abyssinia, it may be of interest to give some account of my experiences in Abyssinia itself. I do not think it is generally understood how far towards the south the Abyssinian dominions really extend, for they nearly touch the two big lakes of Rudolf and Stefanie, or, more correctly speaking, Gallop, or Buzz, and Chuwaha. It always strikes me as a mistake to call a lake or mountain by any other name than that by which it is recognized amongst the tribes living in the neighbourhood.

Although I am about to speak of Abyssinia and of its people, and even at times venture to offer an opinion, at the same time I in no way presume to pose as an authority on the country. Had my sojourn of months been one of years, then my claims might rest on more substantial grounds.

On the afternoon of September 13, 1898, I started from Berbera, one of our ports on the Somali coast, accompanied by Duffadar Shahzad Mir, 11th Bengal Lancers, who had previously travelled with me across Tibet and China, in company with Lieut. N. Malcolm of the 93rd Highlanders. Shahzad Mir is a trained surveyor, and on the present journey surveyed our route by plane-table at 4 miles to an inch, whilst I took observations of latitudes, heights, and temperatures. My only other companion was in the shape of a fox-terrier, "Lady," who completed the entire journey, and is now awaiting my return at Alexandria, together with her son "Puppy," born on our travels.

Eight hired camels sufficed to carry our goods and water, but when the Somalis saw the insignificant size of my caravan, they exclaimed, "That gentleman won't go very far!" There were consequently many applications for service under my flag, though I enlisted only two servants, one called Mahomed Hassan, to look after my property, who very faithfully served me throughout my travels; and the other to cook for me, who rejoiced in the very appropriate name of "Hash."

In the absence, at Berbera, of mules or ponies, we set out on foot, steering a direction west by south, and in ten days reached the Abyssinian frontier fort of Jig Jigga. Here a few days' delay was forced upon us till permission had arrived from Harrar for our onward progress. Ras Makonnen, King Menelek's nephew, who governs Harrar and its dependencies, readily gave his consent, and somewhat upbraided the official at Jig Jigga, who, by the way, was a most obliging Arab, and had merely carried out his duty, for having delayed me. The moment

* Read at the Royal Geographical Society, June 18, 1900. Map, p. 380.

we left Jig Jigga a thorough change in the aspect of the country was observed, for instead of the thorn bush and sandy plains so typical of Somaliland, we passed through a smiling country of hill and dale, rich in cultivation and rivulets, and we could quite understand how, when Menelek claimed the fort of Jig Jigga as the western extremity of his dominions, his decision might have been actuated by the lie of the land itself, and quite properly too.

At Jig Jigga we had risen some 5000 feet from the sea-level, and we had another 2000 feet to mount before reaching the town of Harrar. I was fortunate in finding encamped without the walls of the town H.B.M. Agent, Captain Harrington, through whose kindness and able assistance I had no difficulty in preparing for my journey to Addis Abeba, the capital of Abyssinia. Before starting I enjoyed a few days' rest on the bracing hills of Harrar, overlooking the greenest and most fertile of rich valleys.

On October 6 everything was in readiness, and Harrington and I started for the capital. Two days later we were joined by Mons. Legarde, the representative of France, and by Ras Makonnen, with a following several thousands strong. Though it was interesting enough to watch the methods of marching and camping of Ras Makonnen's host, still there were drawbacks connected with it as well, for along the road our life was frequently more or less in jeopardy. Every one strove for himself to reach the next camping-ground, and these multifarious exertions along a single road were bewildering and far from pleasant. Some Abyssinians were mounted on mules or ponies, others were walking, yet all were armed with guns, sticks, swords, or tent-poles. Then there were no end of animals laden with flour and driven along by the soldiers' wives or servants, who generally carried their master's shield or gun; there were women with burdens of flour and broods of youngsters, white-turbaned priests, living beef and mutton, petty chiefs, with mounted attendants—a striving endless stream, all bound for the same point, and all moving at a different rate. No wonder, as we tried to ride along quietly, we would sometimes find ourselves half knocked out of the saddle by a laden mule tearing past at break-neck pace, then, just as we were recovering, a prod from a pole in the other side would surprise us, almost breaking a rib, and at the same moment a bullock just in front would suddenly halt. After a few days of this fun, we were glad to quit the society of the Ras's army, and enjoy the grand forests of cotton trees and park-like land through which the road to the capital runs. The two salient features that struck me as remarkable during this portion of the journey were, firstly, the vast stretches of grass land that lay idle; and, secondly, the scarcity of villages and cattle, for it would be difficult to hit upon land more suitable for growing and breeding.

On October 25 we reached Addis Abeba. The most striking fact with

regard to the capital was the absence of trees. Though formerly thickly wooded, these have by degrees been cut down for domestic purposes, and each day wood becomes dearer in proportion to the distance from which it has to be brought in. Whether the capital will be shifted, or trees will be planted, or wood will be considered unnecessary, remains to be seen.

I should have mentioned that at this time Ras Mangashia, the governor of Tigré, had displeased King Menelek, who was about to march northwards against him, to try and bring him to a sense of loyalty—hence the arrival of Ras Makonnen and his support. In two or three days' time I found myself marching towards Tigré with the king and a following of something between 50,000 and 100,000 strong. Undoubtedly the most picturesque group in this mighty host was Queen Taitu herself, who was seated on a mule and surrounded by her lady attendants, likewise mounted, each of whom carried a bright and different-coloured sunshade. They were preceded by a group of mounted reed-players, and escorted in front and in rear by a guard of cavalry soldiers. As this pretty party drew near me, I felt anxious to show my respect for them, yet hardly cared to imitate the custom of the villagers along the route, who stripped themselves to the waist and cried aloud "Janhoi! Janhoi!" (King). I contented myself with lifting my hat and sticking to the rest of my garments.

I have no time to tell you how the king showed himself to be a sportsman by the way he rode in mimic battles and by the way he cast his javelin, or how he showed his generosity by the lavish way he feasted his subjects, or how he showed his consideration for the poorest of his beloved people, or how he showed himself to be a mighty organizer and administrator, and how he showed himself to be a genial and thoughtful host; I will merely mention his own kindness towards myself, for one day he informed Harrington that I might travel wherever I chose in or out of his kingdom, and, furthermore, that he would assist me in every way he could—a promise he most faithfully observed. On bidding farewell to the king, I sincerely thanked him for his goodness, and asked him what could I do in return, for I had not even made a present to the monarch. "Nothing at all," he said; "only let me have copies of the maps you make of the country you go through."

We had been travelling with the king through a continuation of broad green-turfed and well-watered valleys, separated by low ridges; thus, with a keen frost by night and a clear sky by day, nothing could be more enjoyable. We returned to the capital by a more direct route, traversing narrower valleys, some of which were rich in cultivation and bounded by basalt-crested hills. There grew the juniper and kusso trees, the latter with its large red hanging flower, so famous as a medicine. We then crossed a pass called the Hulu Koh, said to be over 12,000 feet high, thence to the Entoto range of hills, nearly 10,000 feet high, which

overlook the present capital, planted 2000 feet lower in the plain below. Arrived at Addis Abeba, I set about collecting a caravan for the journey that lay in front of me. There was no lack of volunteers, and I was soon ready to start.

My party consisted of 30 Abyssinians, 9 Somalis, and 5 Sudanese, Shahzad Mir, and my terrier. My Sudanese had previously taken part in the Böttego expedition, and were with the Italian when he was killed by the Abyssinians. I carried nearly four months' supply of food for every member, in the shape of "durgo" flour, and "durgosh," a preparation from the same—a decidedly useful article, for it is merely mixed with cold water and is ready for eating. I also carried plenty of pepper for the Abyssinians; plenty of water-cans, and a collapsible canvas boat, so as to be ready for both a surplus and a dearth of water; 6000 rounds of ammunition, which was never required; tents for everybody; a theodolite, plane-table, barometers, thermometers, and hypsometer, and the general impedimenta required on such a trip, as well as cloth, beads, knives, and so forth, for barter. I may state that, contrary to advice, I used no filter and no bed, and was never unwell throughout the entire journey, excepting the day after my slight attack under the influence of the devils of Walamo; my only misfortune was losing a finger on the shores of Lake Rudolf.

From Addis Abeba we steered south for the sacred hill of Sakwala, which rises abruptly and conspicuously from the plains. At the summit I found a sombre lake, said to be of unfathomable depth, and nearly 9000 feet above the sea-level, water boiling at 195.8° , whilst the hills around that held in the divine water rose to a further height of 600 feet. Parts of them are thickly wooded, and harbour sacred buildings and holy men. There is a mysterious air of sanctity about the place, and many legends connected with the silent spot are credited. The moment we left the capital we fell in with the Gallas, and continued to meet different tribes of them in each district we traversed. All these Gallas have quite recently come under the sway of King Menelek. The result of this has been that with their independence they have also lost all inter-tribal strife, for peace reigns throughout the land. Of course the tribes vary considerably in their condition, according as they accept their ruler with good or ill grace. In some districts the discreet administration of King Menelek was obvious, for Galla chiefs were living in concord with Abyssinian officials, and ruling in combination. There is no doubt that Menelek aims at, and for the most part succeeds in, governing with justice the people and country he has conquered, and the ill doings that are sometimes recorded must be laid to the door of some of the petty officials, anxious to display their own authority, and not that of the king.

I will rapidly run through this Galla country, and which is subject to Menelek almost as far south as Lake Gallop itself.

Owing to the late arrival of my rifles, it was the middle of January, 1899, before we bade farewell to the saintly Sakwala and its neighbour, the river Hawash, so full of fish and hippopotami, which we had crossed on our way from Harrar to the capital. We steered again south for Lake Zuai, passing through the Arusi Gallas, and crossing the river Maki, which flows into the lake at its northern end. This fresh-water lake abounds in hippos, and extends southwards for about 30 miles, lying at a height of over 5000 feet above the sea-level. It is the first of an almost continuous chain of lakes extending as far south as Stefanie, or Chuwaha, and I followed a route more or less along the watershed running between this chain and the river Womo, or Omo. Along the western shore of the lake Zuai we found the Waiyu Arusi Gallas, and after them the Gombo Arusi Gallas; both of them were exceedingly poor tribes. Cultivation is unknown, but they possess donkeys of a good stamp, and depend for an existence to a certain extent upon the chase. They hunt the elephant with the spear, a more hazardous method, I should say, than that of the Hamran Arabs, whose prowess with the sword has been so graphically described by Sir S. Baker. At the southern end of the lake there is an outlet by the river Suksuk, which flows through banks of chalk 100 feet high, into a second lake called Hora, whose water, though brackish, is drinkable. Its banks are covered with a white crust of carbonate of soda, and show the marks of the numerous and varied game that comes to drink there. Along the shore, I met a hunting-party returning from the chase. They were walking by the side of their jaded ponies, and were thoroughly downhearted, for they had been away a week and had met with no success. I felt very sorry for the poor fellows, for these good people, despite their famished state, had brought me a goat and some honey. I afterwards fell in with another larger hunting-party. They were riding down a big herd of hartebeeste, and as they swept past my little party, I jumped on to my swiftest pony, and, seizing a spear, joined them in the fun. There is also a stream joining Lake Hora to a third lake called Lamina, whose water is exceedingly brackish, though the savages inhabiting the islands drink it, and the hippopotamus, as usual, thrives there.

A little west of Lamina we fell in with the Tuki Arusi Gallas, a, comparatively speaking, well-to-do people. Though they cultivate no crops, they collect the white crust from the edges of Lake Lamina, and sell it for grain to the Guragues, living further west. They are also keen elephant-hunters. After passing through the two small tribes of Adari and Waragi, we came to the Guragues of Wubarakh, having traversed park-like country fed by clear rivulets. These Gallas were a well-fed and cheery lot of fellows, evidently justly governed by the Abyssinian official, Ratti by name. We then continued south, and after crossing the river Shashago, reached the district of Kambata, famous for its hot spring. The vapour was rising from the ground in dense clouds,

and close by a party of Gallas had rigged up a temporary home to heal their complaints by means of the water, so esteemed for its medicinal properties. There is a pond some 20 yards in diameter, where the water was bubbling and hissing up at a temperature of 158° Fahr. There was also a smaller pool, whose water was bearable, and here the invalids lay and stewed. The rocks around were stained a reddish-brown colour. My fox-terrier unwittingly put her hind legs into the wrong pool; her sudden squeals at once told me of the mistake she had made.

The drainage, instead of passing into Lamina, as one would expect, is carried off southwards to Lake Abai. From Kambata we climbed the hills and traversed the fertile and mineral-famed district of Walamo, where, in addition to the usual crops, the red and black soils produce more particularly bananas, palms, tobacco, limes, cotton, ginger (called Zingerbil), raspberries, and godaris, a remarkably good vegetable. The whole country is hilly, and cut up by rivulets of the brightest water, along the banks of which grow big shady trees and a multitude of flowers and undergrowth, alive with birds of bright plumage. It seems strange and almost sad, that such a fairyland should be "devil-haunted." I have already spoken of the "devils of Walamo," and will merely draw your attention to a book which has most kindly been sent me by C. Hives, Esq., called *Demon possession*, where the experiences narrated of China are identical with those of mine in Walamo. There is a curious currency in vogue in this district—it consists of "dormas," which are thin pieces of iron about 2 feet long, fifteen of which go to an Austrian or Abyssinian dollar. One meets the Gallas of Walamo trudging to market with a load of "dormas" on the shoulder.

Throughout the whole of this Galla country, we constantly passed through markets, or gobyiehs, many of which are held in each district on certain days.

Our next province was Baroda, perhaps of greater beauty than Walamo, for the hills are loftier and afford superb views of Lake Abai to the east. Yet this is even again surpassed by the most southern district of Abyssinia, called "Gamo," where at a height of 10,000 or 11,000 feet high lie the most beautiful grassy slopes varied by rich foliage, from which glorious peeps of the lakes many hundreds of feet below to the west are had, and grand views of the ranges of hills eastwards. Throughout all this country, dominated by skilfully planted Abyssinian posts, I received the most lavish hospitality and genuine help and friendship from every Abyssinian general or Galla official I came across, and to them owe a debt of gratitude. On leaving Gamo for the plains, we had finished with the dollar and with Abyssinian kindness. We traversed the plains north of Lake Chuwaha (Stefanie), and crossing the hills of Hammer Koki, abounding in clear white marble and gold too, I believe, on the western side, fell in with the Wangobeino tribe, who are a branch of the Asilli. The Asilli are split up into nine subtribes or

divisions: (1) Bulema, (2) Buri, (3) Sambilli, (4) Bursa, (5) Chakanda, (6) Wangobeino, (7) Kasha, (8) Kulambeino, (9) Kurkuna. Of these, the Kasha and Wangobeino are considered to be most warlike. They believe in the heavens, which they call Wak, and agree that whenever it thunders a white man is born. They therefore believe that a white man can produce rain, as well as their own priest, whom they call Dobie. The priest also says a few kind words at marriages, and receives ghi, money and sheep, in return. The Asilli men may have four or five wives, paying as much as twenty sheep or fourteen cows for each. They bury their dead by wrapping a cloth round the body, placing it in a hole, removing the cloth, and covering the body. The cloth they get from the Borana tribes by Lake Stefanie, or Chuwaha. They adorn themselves with small copper earrings, and wear round the neck, wrists, and upper arms many iron, brass, and copper rings. Those round the neck are valued at the price of a cow. They also carry a knife locally made, secured in a leather sheath and fastened to a leather strap round the neck. The Asilli begged me to stop with them and show them how to make guns, that they might resist the Abyssinian raids, for they bitterly complained how all their property had been lifted. I asked how they managed to buy a wife when all their cattle had been taken. "Oh," they said, "we can't buy them now; they come to us instead!"

We met no other tribes till we reached the Gallopa of Lake Gallop (Rudolf), and before marching south I visited the river Womo, or Omo, and crossed to the village of Murle. The water here was not more than 30 yards broad, about 20 feet deep, with scarcely any appreciable current. At Gallop, or Rudolf, we lost more than half our transport from anthrax. In this predicament we turned our thirty head of cattle, which had been presented to me by the Abyssinian chiefs, into baggage animals. It will be gathered from this that our progress for about three weeks was wretchedly slow; I will therefore reverse the case and bring you with one bound to Teleki's volcano, at the southern end of the lake, with two short remarks. Firstly, there was no water flowing in on the eastern shore, nor could I find any 30 miles east of the lake. I should say, the only permanent supply of water running into the lake comes from the Omo at the northern end; but the lake bore no appearance of diminishing in size. The water, though quite drinkable, as our experience amply proved, is, however, scarcely pure. Secondly, on traversing the southern portion, which was a succession of igneous rocks reaching down to the water's edge, I came across a mass of camel-bones in one spot only, and curiously enough two of my cattle selected this very same spot to lie down and die.

At the southern end of the lake, we found the Lokub and Bomi tribes, the latter owning camels and the former donkeys, identical in form and carriage with the many wild herds of the district. The Lokub are a race of finely made men, with long hair stretching down

to the waist. They manufacture many wooden articles, such as water-vessels, bowls, and spoons, and make peculiar pack-saddles for their donkeys. They wear beads round their wrists, and rings of iron round the arm. Close to their village I found a quantity of rock-salt.

On leaving the lake to strike a westerly course, we ascended the hills over 1600 feet above our camp by the lake, and, after meeting the Turkana tribe, met the Loka; and I will show you how the Loka helped me to succeed in curing the natural bent of my Abyssinians, who were always eager to shoot every savage, or steal everything they saw, though never allowed to do so.

As regards raiding—which I may deal with later on—it must be remembered that the Abyssinians, like the tribes bordering on them, have for ages lived in internal strife and conflict with outside tribes. As it happens now, the Abyssinians have been permitted to receive unlimited supplies of rifles, and can indulge in their natural bent as much as they choose, unchecked by those less fortunately armed. Had their neighbours received rifles instead, they in their turn would have taken good care to pull off old scores and run free. When our relations with the Abyssinians are more friendly, and our dealings more direct, they will doubtless learn and approve of more civilized ways. As it is, the Abyssinians are not to be blamed for a moment; they would be foolish if they did not adhere to their ancient customs, when they can do so without harm to themselves, by the importation of so many firearms into the land.

When approaching any tribe, I would leave my caravan a mile or more behind, and go up to the people with a couple of men. On this occasion, I suddenly found myself close to the Loka, reclining under some dome palms. They sprang to their feet, and we stood facing each other, when they all at once turned and ran, leaving behind them an elderly lady. After loading her with presents, and explaining to her that I wanted camels, I sent her away. The following morning, when two of my Abyssinians were on watch over the mules grazing, they saw a single savage, leading a camel, coming towards them. As he came he picked up sand and let it trickle to the ground, as a sign of friendship. Then the inborn nature of the two Abyssinians displayed itself, for they sat down and began firing at the savage; still he came towards them, picking up sand, and still they fired. Closer and closer he came, within a yard, yet he and the camel were untouched; then one of the Abyssinians caught him by the shoulder, and the savage plunged his spear into his chest, doubtless fearing treachery. His comrade then struggled with the man, trying to gain the weapon. The Abyssinian won the victory, and plunged the spear through and through the body of the poor savage. At this same camp it chanced that another of my Abyssinians caught hold of some of the property left under the palms by the Loka, in the shape of some poisoned arrows; this black poison touched a

scratch on his finger. In two days the poor fellow died from it. After leaving this eventful camp my Abyssinians were as good as gold; their natural bent for shooting and stealing was completely crushed.

After leaving the southern end of Lake Gallop, I, roughly speaking, steered a westerly course till about midway between the lake and the Nile valley, and then travelled northwards through a blank on the map towards Fashoda. I will first mention the tribes we met, and then speak of the country we traversed.

Before striking north we several times came in contact with the Turkana, who border on the Loka, Sokul, Bomi and Karamojo tribes. On every occasion I found the Turkana quite friendly, anxious to trade with me, and ready to help me in the way of showing me where to find water, and giving me information of the neighbouring country. The Turkana are a fine race of men, and the families, which apparently exist in separate villages, vary in their development and stature. Some of the men stand quite 7 feet high, and are exceedingly muscular; their hair, resembling thick black felt, hangs over the shoulders right down to the waist. In the end of the hair they attach a thin curly stick resembling a tail, and are always careful, when sitting down and so forth, that it does not meet with any mishap. They wear rings of iron round the neck, forearms, and some of the fingers, ostrich feathers in the hair, brass rings in the chin and nose, rings of hair round the biceps, and sandals of elephant-hide. The women, who wore their hair in ringlets, were finely made and full of merriment, and, for savages, good looking. They brought me plenty of milk in wooden vessels. The men carry, as a rule, two spears, a stick, a long receptacle for tobacco, and a wooden sleeping-pillow. The Turkana live on meat and milk, and some of them possessed a little dhura, though not of their own growth.

The Loka were one of the nicest tribes I met; they were quiet, respectful, and intelligent, and are apparently raided by the Turkana. They too grow nothing, but possess donkeys and sheep.

Between the fourth and fifth degrees of latitude we came across a powerful tribe called the Abba. These people were most anxious to sell me dhura for beads, dhura which they grew themselves. The men, women, and children flocked to see me, probably the first white man they had seen. As usual, the men were quite naked, the women only wearing a small piece of skin. The men fashioned their hair into the shape of a saucer bottom uppermost. They carry two spears, a long and short one; the latter was sometimes entirely made of iron and carried in a leathern scabbard. They also have oblong shields of hide and thick straw, and smear themselves with mud and red stripes. They wear pieces of brass in the ears, and a kind of leathern sword scabbard on the wrist. They wear a mass of beads on the forehead,

whilst the women wear them round the neck. They are a fine race, and live in tukls raised some 5 feet above the ground.

I don't think they can be the same as the Arbore Gallas shown on the map, for the Abba are Gallas neither in appearance, habits, nor language. Other tribes north-east of the Abba we met were the Tamata, the Geyu, and Boma. All of these were friendly enough, possessing donkeys and sheep, and cultivating dhura. All these tribes in many respects resemble the Abba. About the sixth degree of latitude we met another powerful tribe, the second Boma, inhabiting hills between 3000 and 4000 feet high. At first they prepared to fight me, but on finding that I had only two or three men, and was not an Abyssinian raid, they soon became friends. The tribe carry three spears with a slender shaft, and smoke pipes, and follow the customs of the Abba. They inhabit a beautiful country of dale and stream, growing dhura and tobacco.

The soil is exceptionally rich and black; cotton, wild fruits, and fine timber adorn the hillsides. Next to the Boma live the Morelli east and north, and next to these the Nyuro, and working northwards the Shilluks (?), who would never come within several hundred yards of me; they fled from their well-provisioned villages and extensive fields of dhura, taking us for Abyssinians. The tribes of these districts would adopt the ancient English custom of making huge bonfires, the smoke of which would warn the tribes for miles around of our coming, and the signal would be passed on from one tribe to another. Though the people fled, nothing of their belongings was touched by us, excepting in three villages, from which we took some grain, leaving beads and other articles in place of what we had taken, and, as prices went, a full value. As we drew near to our Anglo-Egyptian fort of Nasser on the Sobat, we met the Nuers and Nyuaks, all of whom were extremely friendly, and already beginning to show beneficial results from the recent administration of the country. As we worked our way towards Fashoda we met the Dinkas and Shilluks.

It is impossible to speak more here about the tribes, as I still have to describe the country we travelled through between Lake Rudolf and the Nile valley. Generally speaking, the country consists of a number of ranges of hills running north and south, separated by green and fertile valleys.

Many of the high peaks appeared to be topped with white and pink sandstone dropping perpendicularly, whilst most of the hillsides were green with bush, trees, and grass, with rocks of basalt here and there. Before striking north we crossed the sandy bed of the river Turkwell, thickly and beautifully wooded on either bank, and traversed some of the ranges of hills, but not without trouble, for it was not always easy to find a way. Most of the valleys were wonderfully fertile, with rich alluvial and black cotton soil. I often wondered why there was nobody

to inhabit these inviting districts. On May 13, in about lat. 4° , we struck a source of the river Sobat. On reference to the map, it will be seen that the source we discovered, and which is called Ruzi by the natives, drains a great portion of the land and carries it off northwards for over 300 miles before eventually emptying itself into the White Nile by means of its mighty tributary, the Sobat. This stream, Ruzi, we more or less followed, till it eventually flowed into the large river. By more or less, I mean that on one day we could see the course of the river, and on others, owing to the flatness of the country or the intervention of a hill, we would lose sight of it, and once, when it took a big bend eastwards, we were without it for some days. After striking this source we continued through the same kind of country, rich in undergrowth, and at times fine timber, but at others displaying a gravel soil cut up by innumerable watercourses running into the Ruzi. There were elephants, giraffes, rhinoceros, antelope, guinea-fowl, partridges, and sand-grouse.

Almost 100 miles north of the source of this river, we struck another stream at a few miles west of its own source. This river was also named Ruzi by the natives, and it would thus appear that the word Ruzi merely signifies a river in the same way as we speak of the sea without calling it by any special name, or merely speak of "the river."

The source of this second Ruzi rose from a range of hills lying to our east, on the other side of which range flowed northwards our first Ruzi, after having made its bend towards the east. It was on the banks of this second Ruzi that we met the first Boma tribe. It flowed west at first, merely a streamlet, and then north over a magnificent prairie land alive with herds of gazelle, giraffe, and wild donkeys striped like a zebra. As we continued to generally follow the course of this river, the first Ruzi flowed westwards again, so that we marched north between the two streams, which sometimes were within 2 miles of one another. We passed through strings of villages, large tracts of cultivation, grass land, and forests, till eventually, in lat. $7^{\circ} 50'$, by which time we were on the right bank of the eastern or first Ruzi, we found ourselves on the banks of another river flowing apparently from the south-east. This river was over 30 yards broad, from 8 to 10 feet deep, flowing about 3 miles an hour, and infested with alligators. In spite of the steep muddy banks, we managed to successfully cross it, losing neither camels, donkeys, nor mules.

This third river, combined with the two Ruzis to form one, flowed northwards over immense plains and past villages that had been deserted many months. Keeping on the right bank of this river, we crossed another important tributary flowing from the east and then came to one that stopped our progress. It is known as the Baro, or Keir, and flows from the Abyssinian hills. It had evidently felt the commencement of the Abyssinian rains, for it was perhaps 50 yards broad and

flowing very fast, and, to judge from the thick colour of the water, was carrying off that valuable soil which enriches the Egyptian lands. This river combines with the river we were on and the united stream forms the Sobat. We therefore crossed our own river to the left bank, and then followed the Sobat north-west.

As we reached the neighbourhood of the Anglo-Egyptian fort of Nasser on this river Sobat, we were welcomed by the Nuers, who of their own free will crossed from the right bank of the river to conduct us to Nasser—a valuable help, as we had experienced considerable difficulty through our inability to avoid the swampy districts, in our ignorance of the lie of the land; though now, with the experience I have gained, I could march dry-shod from Nasser to the south of Lake Rudolf, excepting the actual crossing of rivers, and see no obstacles to prevent our laying a line of telegraph or even railway.

These Nuers, though some 600 miles from the centre of our administration, had nevertheless felt the beneficial results of it, as shown by their readiness to help a white man, and their craving for cloth, one of the first signs of civilization. I could not help comparing the probable future of the tribes who had now merely felt our rule, with those who were touched by the Abyssinians, and I wondered what would be the fate of the contented and harmless and naked tribes I had met who are so far independent and free, and untouched by either power.

We followed the left bank of the Sobat to its junction at Sobat with the White Nile, everywhere receiving kindness from the Nuers, Nyuaks, Dinkas, and Shilluks alike. From Sobat we proceeded to Fashoda, where H.H.S. *Fatch* conveyed us to Omdurman. Two or three weeks in this historical place allowed me to form some idea of the stupendous efforts, tact, and determination that must be needed to claim for cultivation the immense stretches of sandy barren land, and to induce hordes of irrational and indolent and trodden-down people to return and work for their own profit. Yet the strides that have already been made are worthy of admiration. At the same time I could not help reflecting that, had I the administration of this new country, I should feel inclined to dally but little over the sandy lands, but seek those fertile regions further south. At Omdurman I parted with my transport animals, including ten of the original mules that had set out from Addis Abeba seven months ago. They were sold by auction in the market-place. Here, too, my Sudanese, who had served me splendidly throughout, elected to remain. My Abyssinians and Somalis travelled with me to Cairo. Trains and boats they became accustomed to; they had been much interested in polo at Omdurman and in the workshops at Wady Halfa; and at Cairo the electric trams, carts, and bicycles (which they called "baklo" mules) evoked but little wonderment compared to the electric light and a water-tap. I think they will always remember their three days at Cairo, for the Sirdar himself came to see them, and

presented them all with plenty of food and new suits of clothing and rugs.

From Cairo we trained to Suez, whence a B.I. liner would convey them to Aden. From there the faithful Shahzad Mir would return to India, the Somalis to Berbera, and the Abyssinians to Zeila and Harrar. It was hard to part with these good fellows, and gratifying to hear them say, "My belly is full; I will go with you again." For it must be remembered that these Abyssinians were the first to leave their country in this way; they had never heard of any other country but their own, not even of the Sudan. They were not chosen men in any respect. They were merely loafers picked up in the market, ignorant of everything, excepting things within their immediate neighbourhood. Many of them were merely boys. It was, therefore, asking a great deal of men like this to travel to the margin of their own land, and through districts where the tribes are raided by strong forces of their own countrymen, thence to traverse for hundreds of miles an unknown and untrodden land; to work in swamps waist or neck deep, and live on what we shot, or on their own baggage camels, and to learn what thirst and hunger really are. Yet all this they did, and as soon as they had learnt their duty, served me well and honestly throughout. It will prove that in the Abyssinians—and we already know it of the Somalis—there is plenty of the right stuff that only requires developing.

Though I could have taken only Somalis, I brought these Abyssinians that they might see something of the civilized world and of our power, persuade others to follow their example, and take back with them happy reminiscences of their experiences whereby to help to maintain the present friendship existing between ourselves and the Ethiopian king.

Before the reading of the paper, the PRESIDENT said: We have been looking forward to the reading of this paper for several months, in the hope that Captain Wellby would be able to come here and read it in person; but, after going through the whole siege of Ladysmith, and being in a regiment which had to eat its own horses, he is now still with the army in the field under Sir Redvers Buller, so we must forego the pleasure of welcoming him home until next session.* Meanwhile we cannot put the paper off any longer, and Captain Wellby's father has kindly consented to read it for him.

After the reading of the paper, the following discussion took place:—

The PRESIDENT: Captain Wellby has gone over, during the greater part of this journey, entirely new and undiscovered ground, consequently there are not likely to be many persons here able to join in the discussion from personal knowledge, but we have gentlemen present who have been in other parts of Abyssinia. I am rather inclined to think that Colonel Prideaux is present, who was so many months a prisoner under King Theodor at Magdala; and Sir Thomas Holdich, who has travelled through a great part of the country and paid close attention to the subject. Colonel Watson is very well acquainted with the upper Nile and

* The sad news of Captain Wellby's death has since been received (see p. 358).

parts of the Sobat. I don't know whether any of these gentlemen will care to address the meeting.

Colonel WATSON: I was a little surprised at Sir Clements Markham mentioning my name in connection with this subject, because it is a good many years now since I have been in the upper Nile region, and I have not had the great advantage enjoyed by Captain Wellby of travelling through the country between the lower end of Lake Rudolf and the Sobat, but at the same time I feel, perhaps more than many here, the vast importance of this journey. One of the great questions of the future with reference to the opening up of Africa is the finding of a good route between the White Nile from Khartum and the countries in the vicinity of Uganda. Of course we have the White Nile itself, but it must be remembered that the White Nile from Fashoda, and from the mouth of the Sobat, where it turns west and again south-east, is a most disagreeable river. I have travelled on it, and know something of its navigation. It is sometimes blocked altogether by reason of the floating vegetation, which is known as the sudd, and which occasionally blocks the river for years. When I was with General Gordon at Gondokoro, we used to discuss the question of what was the best route from Khartum to the south, and used to express the hope that a road might be opened from the Sobat, and General Gordon thought this would do away with the difficulties of navigation. The country would be a good one to travel in, a far better country than that which borders the White Nile itself. Captain Wellby is the first man to show the great advantages of that route. He has shown that it is an easy country to travel in—that the people are good to deal with; and I believe that one result of this paper may be to direct the attention, both of people in this country and the Egyptian Government, to the great advantages of opening up that route; to divert their attention from the White Nile, to a road from the Egyptian station of Nasser to the south, which I believe some of us may live to see converted into a railway. I think it would be one of the best means of opening up the interior of Africa from Egypt to Uganda, and I hope when that day comes that we shall not forget that it was Captain Wellby who was practically the first to show the possibilities of this route.

Sir THOMAS HOLDICH: My own experience in Abyssinia is hardly such as to justify me in adding much to what we have heard from Captain Wellby's interesting paper. You are all aware that this is not Captain Wellby's first exploit. It is not so long ago that he crossed Tibet from west to east by a route which no man up to his time had attempted, and which has not been followed since. On the present occasion he had with him my well-tried old friend Shahzad Mir, who, if he makes as many tracks about Africa as he has made about Asia, will be the most travelled person in the world.

I would caution you against accepting what you see in this somewhat sketchy map as a fair criterion of the amount of geographical knowledge which Shahzad Mir brought back. Of course the most interesting part of the journey is that to which Colonel Watson referred—that part of the country which lies between the highlands of Abyssinia and the Nile. I am very pleased to hear that Captain Wellby considers this to be an easy country. I have always thought otherwise, drawing my conclusions from the paper read by Colonel Macdonald, but until we have complete knowledge—more accurate geographical knowledge, I think it may be a little premature to jump to conclusions about its real possibilities. I trust, however, that when Captain Wellby has finished with the more thrilling experiences he has just undergone, he will come back to us, and we shall have the opportunity of hearing from his own lips something more about that strange country, which must inevitably hold within it so many chapters of future history.

The PRESIDENT: The region which has so recently been traversed by Captain Wellby is one to which our attention has been turned for the last six or seven years, and is one of the most interesting of the unknown parts of Africa. We have had the journeys of Dr. Donaldson Smith, Mr. Cavendish, and others, in the southern parts of that region. We supposed, as Sir Thomas Holdich has said, that the country was exceedingly mountainous and difficult; it appears from the discoveries of Captain Wellby, that it is an open country well supplied with game and well watered. On the north of the Sobat there is, I believe, a still more interesting mountainous country in the districts of Enarea and Kaffa, south of Godjam, which I am anxious to see explored. Captain Wellby has made a magnificent beginning, having marched from the southern end of Lake Rudolf to the Sobat, and I am sure you will all wish to pass a very cordial vote of thanks for the paper which has been communicated to us, and a vote of thanks to Mr. Wellby for his kindness in coming here and showing the interesting series of views taken by his son.

CAPTAIN WELBY'S MAP.—The sketch-map of Captain Wellby's journey from Addis Abeba to Nasser is reduced from his plane-table survey, and is intended only as a route map. Owing to Captain Wellby's unavoidable absence in South Africa, it has not been possible to obtain his assistance in the construction of a complete map.

THROUGH HAITI.

By HESKETH PRICHARD.

I LANDED at Jacmel, on the southern coast of Haiti, on November 16, 1899, my expedition being undertaken on behalf of Mr. C. Arthur Pearson for his new daily paper, the *Express*. I had been round the coasts of Haiti two years previously, and had been struck by the fact that, although it is situated in the centre of other civilized communities, and is itself supposed to be under the influence of civilization, yet locally no one seemed to know anything about the interior or the condition of the people. All sorts of wild stories floated about the neighbouring islands, but I could find out nothing definite. Even on board the West Indian liner on which I went out last year, a steamer that actually calls at Jacmel to land the mails about five times a year (and has done so for about twenty years), it was impossible to get any accurate information more recent than that contained in Sir Spenser St. John's excellent book, published a considerable time ago.

On all sides, however, I was assured that for a traveller to land casually at Jacmel with the intention of riding across to Port au Prince was an extremely risky proceeding. I was warned that the chances were strongly in favour of his never reaching the capital. These counsels, as is often the case, luckily proved to be entirely mistaken, for, apart from the risks inseparable from riding at night over a rough track, much of which ran along a river-bed, no danger whatever menaced me on my ride across the Tiburon peninsula.

Jacmel lies in a fold of green cliff on the edge of a beach, where the plunging surf breaks almost at the foot of the palms. It looks

picturesque enough from the sea, its white houses set amongst vivid green; but when I landed on the rotten black wharf and made closer acquaintance with its realities, I found other terms more applicable to it than picturesque! The streets are incredibly dirty, for the Haitian never dreams of either mending or cleaning them, and sanitary matters appear to be outside the range of his intelligence. Refuse of all kinds is simply thrown into the roadway and left for the sun to deal with.

But the place teemed with life; a noisy, vociferous crowd of negroes of all sizes and ages jostled each other through the dust and glare. Processions of under-sized donkeys, laden with guinea-grass, passed up and down amongst them. All was life and bustle of the idle sort. Empty walls scarred by fire marked spaces even in the principal streets. No one, except some negroes carrying coffee-sacks, seemed to have work—properly so called—in hand. Indolence, neglect, and decay had set their mark on everything around.

Although Jacmel is the chief port in Southern Haiti, no hotel or other available shelter for the traveller exists within it. I was indebted to the kindness of H.B.M.'s consular agent for food and lodging, and spent a short time in riding about the town and adjoining country. On the top of a hill near by there was electric plant, which I presume some enterprising member of the Government had caused to be purchased and put in position. But there the matter ended apparently, for it lies unused to-day. This fact is so characteristic of the ruling spirit of the country that I mention it.

Having secured a guide and a permit, I set out on my journey to Port au Prince. The guide, whose name was given on the passport as "Petit Sans-Nom," was a small man with the inevitable scanty goatee which distinguishes the Haitian negro. He was mounted on a little mule, which I found was meant to carry my baggage as well as the person of its master.

If you take a map you will judge the distance between Jacmel and Port au Prince to be about 25 miles, but when I tell you that there are between 120 and 150 fords to be crossed (the number varying with the seasons), and that the road turns back upon itself and follows the bends of the rivers, you will understand that the local estimate of the distance as being 68 miles is by no means excessive. There is no such thing as a road; a narrow track overhung by trees and creepers takes you down to the first ford. Thereafter you follow the river-bed as often as not. Luckily, the Haitian horses, small, long-tailed little beasts, are sure-footed, for we were still travelling when night came on, and the track had, if anything, grown worse.

We passed but few huts, and the province seemed to be comparatively thinly populated. At last we reached a hut which was to be our resting-place for the night. It was situated, with two or three smaller hovels, inside a stockade. Windowless and earth-floored, it had

very little more of convenience or comfort about it than the home of a savage. But the owner was the incarnation of the spirit of hospitality.

Before dawn we recommenced our journey by climbing the lower spurs of the mountain range which forms the backbone of the Tiburon peninsula, and before daylight reached the top of the pass, from which we could see the bay of Port au Prince on the north and the Caribbean sea to the south. The heat increased as we went down the northern slopes, but soon there were increasing signs of denser human habitation—huts shaded by mangoes and tamarinds, and shut in by bananas, near which naked children played and their elders lounged in the shade. After a hot ride across the plain, we at last arrived at Port au Prince.

The Black Man's capital, as far as cleanliness goes, is much as his other towns. The same gutters flowing along the streets, the same garbage and refuse strewn over every inch of road surface. The street itself, being absolutely out of repair, is a network of holes, inequalities, and pools. The heavy tropical rains flush them at intervals, but their condition between whiles is indescribable. The chief boulevards are overhung with trees. A steam-tram passes up and down to the harbour every half-hour or so. Military police occupy miserable guard-rooms here and there along the boulevards, and cook their food beside the sluggish drains which meander under the low piazzas, where the men play dice when they are not sleeping in the hammocks slung from the roadside trees. At the head of this thoroughfare stands the cathedral and the palace of the president, but neither of these buildings has any architectural pretensions. Altogether the city is unkempt and unclean. I have visited many other unpleasant towns, but Port au Prince is *facile princeps* as to filth.

After spending more than three weeks there, I started for an excursion into the interior. I determined to make eastwards through the plain of Cul-de-Sac, which is reputed to be one of the most fertile spots in the whole world, to the Dominican frontier. I started from the capital, passing under the triumphal arch of President Hippolyte, on which was the proud inscription, "Progress-Union," and shortly found myself on the way to my first stopping-place, Pompadette, a village of wattle huts.

During the days of the French occupation the plain of Cul-de-Sac boasted a large number of prosperous plantations. The estimated revenue drawn from this region alone is said to have amounted to twenty millions of francs, though at the present time it cannot be supposed to produce as many thousands. The plain itself is, roughly, 27 miles by 24, Port au Prince lying on its western edge, and although the harbour there holds ships from every quarter of the world, and should present a ready outlet for the wealth and produce of its hinterland, the actual commerce of the port is at a miserably inadequate level.

Many reasons could be adduced for this: the absolute lack of all means of communication, for the road by which I travelled—which had once been a handsome highway some 60 feet wide, made by the English in past times—has now degenerated into a bog during the wet season, and during the dry into a series of ridges and hollows and ankle-wrenching holes. The spacious country houses of the French colonists have long ago been devoured by the encroaching jungle. The only living things to be seen beside the owners of the soil were droves of lean pigs, which wandered about picking up a precarious living upon the land that the tropical vegetation has reclaimed from the dominion of man.

Here and there in the course of the day clusters of huts broke the desolate lines of forest. They were primitive enough, these huts, encircled by stockades. The people are very poor—sordidly poor—eking out their living much as the pigs do, upon wild fruits, which they are too idle and too improvident to cultivate. They still pick berries from the coffee-shrubs planted by the French colonists in the old slave days. For the rest, mangoes and bananas afford them provision for the best part of the year. Their huts are mere elementary shelters, many with ruinous thatch and practically guiltless of anything in the way of furniture. The live stock, fowls, guinea-fowl, and pigs, fight for chance refuse of food on the earthen floor, while the most precious possessions of the owner, a couple of gamecocks, are carefully tethered in a corner.

Altogether, however, I came to the conclusion that the happy-go-lucky existence of the people is not without its compensations. They have absolutely no care for the morrow, and they seem light-hearted folk, always ready to take part in the amusements common to the country, dancing and cock-fighting. The measured beat of the drum, which means that dancing is in progress, may be heard very frequently as one rides along those lonely forest ranges, and I have often come upon a solitary figure dancing away by itself in some green shaded nook. I found a cockfight going on at Thomazeau when I arrived there, and the public interest around was evidently universal and enthusiastic.

I had difficulty in procuring any food: the only available provision appeared at first to be pork, but I was by that time far too well acquainted with the scavenging habits of the slab-sided pigs to feel any relish for that particular comestible. However, I managed to procure biscuits of bread and sickly gluey cakes with seeds on top, upon which I made a good meal at the house of the magistrate of the village, who courteously put his hut at my disposal.

This was not the first time I made experience of real Haitian hospitality, and it was by no means the last, for the people in the interior, though exceedingly poor and primitive in their habits, were extraordinarily kindly and hospitable, ready to give shelter at all times, and food, if they possessed any, which in many cases they did not. Payment

afterwards, far from being expected, was often resented, and one had to manage by some small gift, tactfully offered, to repay the hospitality received.

The day passed pleasantly, riding through the forest land upward towards the mountains which form the Dominican frontier. The lower hills were round-backed and heavily wooded, and the bridle-path presented many difficulties in the way of sudden drops or declivities covered with sliding stones underfoot, while overhead one had to dodge hanging creepers and branches, most of which seemed quite unnecessarily to be furnished with thorns.

The farther I went, the more sparsely scattered were the little groups of huts. And wherever a clearing in the trees told of the presence of man, I soon began to expect one unalterable characteristic. Whatever owes its origin to human handiwork is fast falling into decay and ruin, while nature, fresh and vigorous, is always advancing her outposts to the verge of each little circle and plot where the frail ragged dwellings hold their own like forlorn hopes, which may at any time be ruthlessly smothered in the living green of riotous foliage.

A negro, if driven by necessity, may make a thing, but he seems, constitutionally, unable to force himself to mend it. The villagers in the far interior are, in fact, little more than savages. Education has never reached them; they lead a life dull and squalid beyond imagination. A fire smoulders under the four-legged toadstool roof, where the cooking goes forward when there is any; the patriarch of the community suns himself in senile enjoyment, and the other dwellers of the stockade lounge or squat about the enclosure in a dream of existence which has no aim, nothing even so much as to mark the days. People used to come to me at my stopping-places to show me sores and ask me to cure their various diseases, but on the whole, the community appeared to be healthy—wonderfully so, considering their habits and their neglect of sanitary precautions. The luxuries of life are unknown, and dress, save on a journey, has almost become a superfluity.

Farther and farther I rode into the doublings of the mountains, until the early morning found me above the Laguna de Fundo. The forest thinned away to more open country at that spot, and a wind bearing with it the smell of the marshes about the lake blew up the mountain-side. Yet the air was clear and bracing, and the scene marvellously beautiful. All around from the peaked summits to the water's edge the trees spread in an unbroken sea of green, a living wealth of timber. But few trees are ever felled here; a very small proportion reach Port au Prince for export, the absence of roads or any means of transport beyond human portage putting a decisive check upon enterprise in this direction. Yet the possibilities are enormous, as will be seen from the following extract taken from a short paper written for me by a Haitian gentleman with regard to the resources of the island.

"Haiti is a fertile country. It possesses large virgin forests full of very precious woods, land not yet cultivated and capable of yielding the most varied productions, from those of the tropics to those of the temperate countries situated in the heart of Europe. The soil is rich in minerals: one finds iron, copper, gold, sulphur, granite, marble, cat's eyes, antimony, and lead. They say that at Tortuga, an island opposite Port au Paix, there are rich deposits of guano."



ROAD TO TURGLAN.

The mahogany grown in Haiti is peculiarly fine, and enormous quantities are waiting for the opening up of the country, while at the present moment the case stands much as it did in 1898, when the Consular Report contained the following. The export of mahogany from the island was massed with six other items under the remark, "Not of sufficient importance to be quoted"! Haiti is at once perhaps the richest and poorest country for its size in the world.

All about the vicinity of the lake I found traces of the old mansions of the French colonists, but they are scarcely more than knee-high ruins

now. It is just the same all over Haiti wherever you go; all that white energy, industry, and intelligence once initiated and carried on has, since the disappearance of the white man and the ascendancy of the black, practically dropped out of being. All that the white races left behind as milestones on the path leading from savagery into civilization has, from sheer waste and idleness on the part of the present occupiers of the land, been obliterated. As far as the condition of the interior is concerned, the position in the present day is retrogression as regards the human element, and absorption by the forest powers of once cultivated lands. Here you are among a people who by right of race appear to prefer a thatched hut to a palace. At a distance of a very few yards from a stockade you are scarcely aware of its existence, hidden away as it is behind the ingrowth of rank vegetation.

The land is very empty. Animal life is scarce in the Republic. Of course there is no large game, but on some of the larger islets round about its shores cattle have run wild for generations. In the far interior I saw wild dogs and pigs which had escaped from the yoke of mankind. It is always easy to determine the status of the casual pig one meets in Haiti, for the domesticated breed have a heavy triangle of wood slung round their necks to keep them from wandering far. There are not many reptiles, and bird-life is not plentiful. In the neighbourhood of the Laguna de Fundo, I noticed the extraordinary tameness of the birds, which is probably due to the fact that little shooting of this kind is done in Haiti. There are very stringent rules in the country districts, and the hand of the local general is heavy, and any negro sportsman without a permit would run an excellent chance of arrest under suspicion of being concerned in the hatching of some revolutionary plot!

In a defile more than usually lonely and wild, the frontier guard challenged, and the two ragged soldiers who composed it unslung their rifles and demanded passports. A little tumble-down guard-house stood on the cliff above, in a little recess hacked out for it among the trees. It was merely an open shed, and the men came halfway down the bank, glanced perfunctorily at our papers, and before we were out of sight, had sunk back upon their haunches beside their smouldering fire. Meanwhile we were over the border and in the Republic of San Domingo.

At one time the Laguna de Fundo belonged to Haiti, but now half of it is claimed by the government of the sister republic. The water of the lake is brackish, and during times of heavy rain is connected with the larger lake, Enquirillo (which lies entirely in Dominican territory), by water lying in the lowlands between. The climate in this part of the island is delightful, the air fresh and balmy, but on both sides of the frontier the country is practically empty. The chief trail—for it is no more—which lies between the republics is little travelled. A few natives cut timber beside the lake, a few fly from justice, and a rare

farmer in gamecocks crosses the border to find a new market, that is all. The parrots that fly above and the wild pigs that roam below form the bulk of the wayfarers to be met with on the highway between San Domingo and Haiti.

On the return ride to Port au Prince I travelled mostly by night, and happened to come upon the wind-up of a Vaudoux sacrifice, or orgie, whichever one chooses to call it, in the heart of the forest. The people were dancing frantically round a fire, and we stopped and looked on, but no one took the slightest notice of us, so absorbed was the whole crowd in a storm of unseemly swaying, droning, and dancing. The practice of Vaudoux, with its attendant horrors, touches a very vital point in the history of the Haitian negro, but I will refer to that later.

The impression made upon the traveller by the physical conformation of the country is one of bewilderment. Hills upon hills, all shaggy with woods, tossed together in a chaotic jumble, and slashed deeply in all directions by gorges and ravines. The all-pervading greenery is of a deep potato-leaf tint, lit here and there by the pale vivid colour of broad-bladed banana leaves. There is another particular about the country which cannot fail to strike one. A hundred years ago man had conquered nature; now nature has regained her own, and conquered back her lost possessions.

Later on I visited Cap Haitien. This was once upon a time a flourishing place, and called the "Little Paris of the West." In the various ruins which still remain one can trace the relics of a well-built and handsome town. The great earthquake of 1842 began its destruction, and neglect and general decay are quickly wiping out all that is left of it. But mushroom dwellings of wood have sprung up everywhere amongst the ruins. In spite of the disappearance of the older stone-built buildings, the town itself is the cleanest I saw in Haiti. The northern provinces appear to be endowed with a certain amount of energy and industrial enterprise. The labourers on the quays went at their work with vigour, and altogether one noticed an air of business and movement which is not observable elsewhere.

From Cap Haitien I started towards the citadel of La Ferrière, a massive and ruinous pile of masonry set upon the top of one of the mountains which command the plain beneath. It was built in the early part of the nineteenth century by the Emperor Christophe, as an impregnable fortress in the case of war or revolution. They say that the emperor was in the habit of driving up to the citadel in a carriage, but it is hard to believe that he can ever have done so, as for the greater part of the distance no trace of a road remains. The government are very jealous of allowing travellers to visit La Ferrière. The reason for this is, I believe, that the enormous treasures said to have been amassed by the Emperor Christophe are supposed to be buried somewhere inside the gigantic monument of his extraordinary energy. This

Christophe united in himself a ruthless energy of will and action that drove all before him, conquering even the supineness and indolence of those of his own race over whom he had made himself master. He rose from being a waiter in a *café* to the position of dictator over the northern province of Haiti. In spite of the savage cruelty of his nature, he showed a truly kinglike passion for fine architecture and noble buildings. His palaces of pleasure are scattered over the country, notably Sans Souci, which lies on the way to La Ferrière, and overlooks the village of Milot.

From the present condition of Sans Souci, it is possible to deduce some very essential peculiarities of Haitian character. If you compare the description of the palace as represented by Hazard in his book on Haiti, written many years ago, with the condition of the ruin as I saw it, you cannot fail to be struck with the fact that the negro appears to have a racial preference for hovels, or at the best ill-built and inferior buildings. Here is a splendid mansion surrounded by gardens and open to occupation. But it does not seem to appeal to the Haitian. In the days when Hazard visited the country, it was in fairly good preservation and apparently habitable. To-day it is a ruin, a mere skeleton of walls, tenanted by the lizard and the wild bee.

But the fortress of La Ferrière is one of the sights of a lifetime. A huge big solid mass of masonry, streaked with red mosses, rearing its grey front upon the summit of a cloud-hung mountain. Inside it there is little save damp old smells; the woodwork is rotting, nothing but the gigantic shell of the place is intact. Human foot seldom crosses the threshold, and obsolete cannon, some of them covered with stalactites, lie heaped in the corridors. The Général de la Place at Milot, Anahim Amaran, was good enough to give me a soldier as guide, and I own to the fact that I have never been so impressed as when first an opening in the forest which clothes the mountain-side gave me a view of this gigantic deserted citadel, towering up from the summit of a mountain 4000 feet above the sea, a great cavernous empty place with its useless armory of three hundred guns of position.

The alternations of climate on the summit of La Ferrière are remarkable. I had not arrived under the walls when the whole surroundings, bathed but a moment before in yellow tropical sunlight, were blotted out by a blinding mist of rain. Five minutes later the cloud was flying to the horizon, leaving us steeped once more in warmth and sunshine. Later, as we stood in the great hall, the light suddenly went out, and volumes of rainy fog came belching in at the window-openings. We stood in a half-darkness for a few moments, chilled to the bone by a piercing wind, but after a wild splash of rain the sky cleared and the sun shone once more.

In the heart of the deserted fortress is the tomb of Christophe. Jungle and guinea-grass have grown up in the enclosure, through which

we had to push our way to reach the tomb. It has been violated, and my guide thrust in his hand and plucked out ancient bones for my inspection, which, according to his story, were ribs and finger-bones of dead Christophe, the most terrible tyrant whom Haiti has ever known.

After spending some time at Cap Haitien, I embarked and visited various ports all round the island. I returned to Jamaica in January.

II.

There is no other country with a pretence of possessing civilization where such a cult as snake-worship, or Vaudoux, to give it its local name, could exist save Haiti. The reasons are twofold: the racial proclivity of the negro to delight in mysterious and hyper-emotional ceremonies which degenerate into orgies, and the ignorance in which the majority of the community are steeped, and which it seems to be the policy of the government to foster rather than overcome.

There can be no manner of doubt that Vaudoux is merely a survival of the savage beliefs which the negroes, imported as slaves during the period of the French occupation, brought with them from the shores of Africa. Kindred ideas and practices are, as is well known, to be found among the natives of the West Coast at the present day, as well as to a small extent among the negroes of Jamaica and other West Indian islands, and they are also entertained in secret by the black section in the Southern States of America. The chief difference is that in Haiti the people are their own masters; black is the ruling colour, and the peculiarities of the race have there full opportunity for unchecked development.

So in Haiti Vaudoux flourishes exceedingly. There are said to be two sets of Vaudoux worshippers: one which sacrifices fruits, white cocks, and white goats to the serpent-god; the other, a far more dangerous and sinister cult, the lesser ceremonies of which call for the blood of the black goat, and whose ultimate rites can only be carried out by the sacrifice of the "goat without horns," a euphemism for child-sacrifice. White is the sacred colour of the former and more innocent sect; red that of the latter. But my own personal experience leads me to believe that the two divisions, those who sacrifice under the white and those whose ceremonial colour is red, not infrequently mingle in actual practice.

This is, I am aware, not a generally received opinion, but it happens that on one occasion I was lucky enough to witness a function where the flags and handkerchiefs used were both red and white, pointing to an intermixture of the two forms, and the cocks sacrificed were both black and white, again bearing evidence in the same direction.

The Vaudoux ceremonies usually take place at night and in pseudo-secrecy, but the worshippers are practically free from all hindrance or interruption on the part of the authorities. The function is presided

over by the snake in its box, but I had no glimpse of the reptile, nor have I ever met with any white man who had been permitted to see the "god." The rites consist usually of dancing, sacrificing, feasting, invocation, and a Delphic delirium on the part of the Mamaloi, or priestess, the whole winding up with scenes of an indescribable nature.

Testimony as to the order observed in Vaudoux ceremonies differs. By "ceremonies" I refer to the actual rites of sacrifice, which lasted, in the instance I describe, four hours. The whole rites lasted from noon on Thursday till dawn on Sunday. Each man, no doubt, describes what he has heard. But, for my own satisfaction, I noted down on my cuff the sequence of the rites as they took place before me on the occasion of a large Vaudoux gathering at which I was present, and when six cocks were sacrificed. The following is a copy of my notes:—

Dancing to a monotonous song.

Sprinkling water over feast composed of Congo beans, red melons, and various bottles of liquids arranged upon the ground and ornamented with pink flowers.

Mamaloi danced up and down a lane between knees of worshippers, laying a living cock upon their heads.

Mamaloi killed the cock, kissed the twisted bleeding neck, and flung the cock over her shoulder, after which she fell down apparently insensible.

Dancing recommenced, and other cocks were sacrificed in the same manner, but by different persons. The Papaloi sacrificed a black one last of all.

Sprinkling water on the sacrifice.

Blood of chief sacrifice now placed in a bowl by itself, and with it the Mamaloi anointed the doorposts, and made crosses in blood upon the foreheads of the initiated.

More dancing, in which people began to join.

The feast.

Again dancing, which gradually degenerated into lasciviousness.

Not the least prominent feature of Vaudoux is the drum which calls the initiated together, and without which no ceremonial takes place. I examined one, which was about 4 feet high; others of a smaller size are also used. To return to the one I have alluded to above, the frame was of some jointed wood like bamboo, and the girth about that of a man's trunk. The skin used was that of a black goat, the hair still adhering to the edges where it was fastened to the frame, but the centre had been worn thin with the thrumming of many fingers. These drums are so singularly constructed that, although at a distance they sound dull, near by their throbbing call is indistinct and low. Where the negro picked up this secret in acoustics it is hard to imagine. But the peculiarity has an important meaning. A sect with rites like the Vaudoux have naturally urgent reasons for desiring that none but the

initiated should be present at their gatherings. Hence the low muttering close at hand is calculated to mislead the listener, whereas the initiated, who have warning of the function about to take place, hear the beat at really wonderful distances, and at once proceed to the appointed spot.

The evil of Vaudoux is widespread in Haiti, although the nominal religion is Roman Catholic. The black government has at all times been too weak to seriously oppose so powerful a combination. For the Papaloi, or priests, are a living force which has to be counted with in politics as well as in private life. The Papaloi is not only a high priest; he is also a consulting physician. He can cure, he can kill, and the two are often very curiously allied in his practice. He can put you in the way of accomplishing the most cold-blooded revenge on your enemy for a consideration, and he will also provide you with a love-philtre. If you have been poisoned, he will heal you in all probability by means of an antidote. He is unsurpassed in his subtleties of secret poisoning. He can take away your reason with or without pain, or he can induce a loathsome disease to attack you. Nor must it be supposed that the white man is outside his reach. Many now living in Haiti could tell you so.

No priesthood has so strong a grip of the savage mind as that which trades on solid fear, and can also lend its aid to the fulfilment of the earthly passions of its devotees. The Papaloi can do all this. He is the pivot on which Haitian life in the wilder districts moves. Snake-worship, child-sacrifice, cannibalism—the Papaloi is at the root of all these things, and will continue to be so, degrading his country and his race, until some power arises in the land formidable enough to crush him. Haiti can never be other than she is unless that happy event comes to pass.

Looking back upon my time in Haiti, I cannot regard my wanderings in the country districts with anything but pleasure. The negro, when away from the influence of the coast towns and civilization, is a kindly, inoffensive person, liable, of course, to the plunge back into savage superstitions and practices, which seem to touch some incurable susceptibility of his nature; but, apart from these intervals of delirium, I found him in Haiti well disposed, and, as I have said before, the soul of hospitality. Notwithstanding the warnings and unfavourable prophecies poured upon me before I started, I travelled through the interior without meeting with the difficulties and opposition that are certainly supposed to attend the wayfarer in his journeyings there. I trusted entirely to the natives for food and shelter, and, although food was scarce—because of the poverty and idleness everywhere present—I was always offered what there was to be had with politeness and at no very exorbitant price. On one occasion my water-bottle was poisoned. What offence I had committed to merit this I do not know.

Haiti is astonishingly healthy when one considers the absence of all and every attempt at sanitation. Of course there is a good deal of fever, especially during the malaria seasons; but the country is not very swampy, and I am inclined to think that fever is less common there than in many of the other West Indian islands. Yellow fever is not endemic, though cases occur in the ports pretty constantly, the contagion being brought in from other places. Small-pox is rife, and no measures are taken in the way of inoculation or enforced cleanliness to combat the spread of the disease. But, on the whole, in spite of many drawbacks, Haiti appeared to me to have an excellent climate, far more balmy and pleasant than that of any other island with which I am acquainted in those seas. The basin of Port au Prince, cut off as it is from the cool northern breezes, is very hot and enervating; but the Cape, the mountains, and higher ground offer various gradations of agreeable climate and balmy air.

The traveller in the republic must, however, be careful to provide himself with passports, for the rural districts are ruled over by fierce black generals whose will is absolute locally, and who have no hesitation in sending the stranger off to prison as a suspicious vagrant! Now, the prisons of Haiti are appalling places, where the unlucky prisoner is almost certain to fall a prey to some disease. They are overcrowded and filthy to an inconceivable degree. An open yard with sheds round it and a cesspool in the middle, which is never cleaned, is the prevailing model, while the prisoners are expected to buy their own food; and as to medical attendance for the sick, I neither saw nor heard of any adequate provisions for the only too likely needs of the prisoners. It will be seen, therefore, that a Haitian jail is a place to be carefully avoided. As long as you steer clear of the law and its representatives, you can move about comfortably enough through the country, but it is far easier to get into trouble than to get out of it again. Of course the foreigner's consul will be ready to back him up in case of necessity, but in the remote districts, and indeed in many towns on the coast, the consular power is distant and not readily made effective, for the negro in authority is a very great man indeed in his own eyes, and likes to taste the pleasure of putting the white into jail, not to speak of the fact that to the black man's mind force has to be near and visible to become convincing.

It will be remembered that in Haiti the traveller is in a land where black rules white, and the white has really only such rights as his consul can oblige the government to recognize by sheer weight of the power behind him. Justice is not to be relied on, for the negro takes it as an unpatriotic act if any judge even seems for a moment to incline in favour of any white man who appears before him, no matter what good faith and fair play demand. Besides, the government is in chronic opposition to the foreigner. The white element brings much of such

prosperity as Haiti enjoys, but the white individual is not a welcome guest, for he is apt to want to open up the country; he has prejudices in favour of education and sanitation and other troublesome things, so that on the whole the government combine in regarding it as good policy to keep him strictly within narrow bounds.

There is a future for Haiti, but the time is not yet. The riches of the country are entirely undeveloped, probably to a great extent even unknown. The government, following out its traditional policy of "Haiti for Haitians," will not permit foreign interference or enterprise to reach beyond the fringing towns on the coast, and the people themselves are too indolent and too lacking in perseverance to do more than talk about possibilities, and very occasionally to initiate some project, which, however, invariably falls through at an early stage.

NEW LIGHT ON SOME MEDIAEVAL MAPS.

By C. RAYMOND BEAZLEY, M.A.

IV.

NEXT among the examples of mediaeval cartography, prior to 1260, which have been recently studied with such excellent results by Konrad Miller, we may take—(1) The Maps of Matthew Paris; (2) The 'Situs Hierusalem'; and (3) the 'Madaba' mosaic map.

I. In the earlier thirteenth century the monastery of St. Albans possessed what we may call an historical school, or institute, which then, as in the twelfth century, was the leading English centre of this kind of study, and with different environment might have become the nucleus of a great university. Among the writers of this school the greatest was Matthew Paris (1195–1259), who left three works of high importance for English history: the 'Historia Major,' or 'Cronica Majora'; the 'Historia Minor,' or 'Historia Anglorum'; and the 'Historia Sancti Albani.' Beside their general value as chronicles, these writings are of special interest as containing various maps and plans, which must be ranked among the best ever produced by mediaeval geographers, before the rise of true scientific cartography in the 'Portolani.' Thus, in the 'Historia Major,' we have the so-called 'Itinerary to the Holy Land,' or 'Stationes a Londinio ad Hierosolymam,' as well as a *mappe-monde*,* a map of Palestine, and the first of Matthew's four 'Maps of England.' Again, in the 'Historia Minor,' there is another form of the 'Palestine Itinerary,' the second and third maps of England, and the 'Situs Britanniae.' Lastly, in the 'History of St. Albans,' a portion of

* The Cambridge and London manuscripts give two slightly different forms of this. Cf. Cambridge C.C.C. MS. xxvii., at end of vol., and B. Mus. (Cotton) Nero D.v. fol. 1.

the supposed "Pilgrim road," as far as Italy, is given in another shape, together with the 'Schema Britanniae.'

Altogether, then, the manuscripts of Matthew Paris give us six geographical designs: a world-map, in two (slightly differing) copies; a map of England, in four variants; a purely conventional sketch of the Heptarchy in the form of a *Rose des Vents*, and with the title of 'Situs;' a plan, or *Schema*, of the Roman roads in the same country; a 'routier' to Apulia, from the English court; and a map of Palestine, which tradition has wrongly joined with the former, to make a 'Pilgrim Itinerary' from London to Jerusalem.

These works, among all the maps of purely mediæval origin, show the greatest evidence of independent and scientific study. Elsewhere we have seen traces of comparative enlightenment, but in Matthew Paris' maps of England we meet with a more systematic attempt at the detailed and exact delineation of a certain area of the Earth-surface. They are, in fact, praiseworthy examples of what Ptolemy called *Chorography*, and they would be even more important but for another consideration. At the very time that the English chronicler was draughting these plans, compass-maps or scientific coast-surveys were beginning in the south of Europe. In comparison with these Portolani, Matthew's work falls into a secondary place; for at his best the English geographer was only working from description, hearsay, book-knowledge, and approximate determinations. The only basis of true geography, the fixing of terrestrial positions by celestial observations, was first given us on an adequate scale by the new school of Mediterranean pilots and draughtsmen. Again, it was only by extreme minuteness of detail, a minuteness but dimly realized in classical or mediæval designs, that the true chorography (the real beginning of modern survey-work) could be attempted; and the Portolani first supplied this want by the labours of practical mariners.

All this was beyond the range of Matthew of Paris; but the monk of St. Albans came nearer to the standard of the scientific map than any other of the student-geographers of the middle ages. His best work, as we have seen, is not in his general scheme or mappemonde, but in his sectional map of England.

(a) The mappemonde, however, is a thing of some value, showing a curious independence of all other mediæval designs. The London and Cambridge forms of this differ slightly, as, for example, in the far east. The London copy measures 33.8 by 23.6 centimetres; most of the writing is coloured red, except the Mediterranean names lying east of the Adriatic, which are black. The mountains are given in ochre, the rivers generally in blue; the Mediterranean sea is green. The legends on this world-map number seventy-nine; the most interesting of these is that in the neighbourhood of Mount Taurus, which alludes to the three large wall-maps existing in London and the neighbourhood at

the time of Matthew Paris. One of these is ascribed to the hand of Robert of Melkeley; another is called the mappemonde of Waltham, in Essex; the third is termed the property of the Lord King, and said to be in the Court at Westminster. This last had been figured by the direction of Matthew Paris himself,* and perhaps the same authorship may be assumed for the Waltham map. Prof. Miller suggests, with much plausibility, that some features of these lost wall-maps have been preserved in the fourteenth-century work of Ranulf Higden. Their size naturally recalls the scale of the Hereford and Ebstorf designs; but they probably belonged to a better school of draughtsmanship than the latter. Yet, compared to Matthew's England, his surviving mappemonde is a disappointment, and if we were to assume, with Miller, but against probability, that his wall-maps at Westminster and elsewhere presented merely the same features on a larger scale, there would be less reason to regret the loss of these 'Orbes picti.'

The chief peculiarity in that picture of the world, which, after all, is but partially shown on Matthew's mappemonde, is the broad arm running west from the Black sea, and perhaps intended for the Danube. The Maeotid marshes, or sea of Anov, in the far north-west, are represented as near the Arctic ocean, with which they communicate by a river or strait; almost the whole length of the continent of Europe lies between them and the Euxine. Many unnamed rivers appear; the term of *Adriatic* is extended, in a characteristic medieval manner, to the Levant seas from Tyre to Sicily. The text has some resemblance to that in the maps of Hereford and Ebstorf; a little also to Lambert of St. Omer, Henry of Mainz, the Psalter, and the Cottoniana. Most of the newer names may be found in Ebstorf, such as Holland, Burgundy, Flanders, Austria, Poland, Venice, Bavaria, and 'Teutonia,' as well as some places like 'Jerapol'† in the far east of the map near the Caspian. But the great mass of place-designations is ancient; even 'Dacia' (for Denmark) is really an old form misplaced by medieval usage. The curious corruption of 'Brailbe' for Brabant is worth notice among the distinctly later names. Taken as a whole, the form of this map does not allow us to make it a derivative of any other known example. Henry of Mainz has some resemblances in his drawing of Italy, of the Baltic peninsula, and of some of the islands; but these amount

* Some think this example was hung or painted in the Exchequer. Matthew's words about the three maps are, "Summum facta est dispositio mappa mundi magistri Roberti de Melkeleia et mappamundi de Waltham. Mappamundi dñi Regis est in camera sua apud Westmonasterium, figuratur in ordine Mathiei de Parisio." As to its shape and the conception of the world suggested, Matthew adds, "Figuratur in ordine ordine quasi oblonga orbem (a favourite classical simile). Talis est schema nostrae patrie habitabilis scilicet quarta pars terre quae est triangulata hoc; corpus terre sphericum est."

† Hieropolis.

to very little. Perhaps the chief thing to remark about this work of Matthew's is its limitation. It is not really a map of the world, but a sketch of Europe and the adjacent coasts; only the extreme northern edge of Africa is portrayed; as to the parts of Western Asia which are sketched, the author has so little intention of working them out in proper map-form, that he covers most of the space with the famous inscription just noticed about the three wall-maps. Even the Europe of this example cannot be regarded as a finished piece of work; its northern coast is absolutely straight, and apparently follows the requirements of the parchment sheet without any attempt at the representation of the true shore-line. The western coast is little better; England, which Matthew really knew something about, is entirely omitted; and, indeed, it would be difficult to rate the compiler's geography at a high level if we only possessed this design, and could not also refer to his four maps of England.

(b) These last, in their principal forms, at Cambridge and London, are the best specimens of mediæval student-geography, and both the Cotton copies are probably from the annalist's own hand. The Cambridge example, which we may treat as a first draft of the second London copy,* is only a fragment, though a considerable one; the lower third of the leaf has been destroyed, but what remains would be very valuable if we had not the Cotton examples as well. Some peculiarities of the Cambridge design seem to warn us against treating it (as some would do) as a mere copy of those in the Cotton collection. The first British Museum example, in the King's Library, is but a rough sketch containing little more than half the names of the ultimate form. Its execution is careless, and altogether it stands on a humbler level than any one of its chief parallels. On the other hand, the workmanship of the Cambridge and Cotton examples† shows the closest resemblance. The last named are in every respect the most perfect type of Matthew's England; the execution is surprisingly good, and in some parts suggests modern accuracy, especially in Wales, Devon, and Cornwall, in the East Anglian peninsula, in the Humber estuary, and in the line of the Severn.‡ The Thames, however, whose general size is well conceived, is misdirected and twisted round so as to flow into the southern sea or English channel. Matthew's knowledge of Scotland is of course vague; he thinks the firths of Forth and Clyde absolutely divide the land, so that *Scocia ultramarina* is only united

* The Cotton example in MSS. Claudius D. vi. fol. 8, which is, of course, the best of all. The second best is in another Cotton MS., Julius D. vii. fol. 50-53, somewhat damaged at the margin, but mostly intact and of admirable execution.

† The measurements of the Cambridge Map are 23 by 23.5 centimetres; of the King's Library copy, 25 by 33 centimetres. The latter is coloured black, except the sea, which is green.

‡ As to the Welsh shore-line, the peninsular character of this land of Wales, and the curve of the Severn, the Cambridge copy is even better than the Cotton examples.

to the southern island by a bridge. The Orkneys are placed in the north-east, following the trend of the shore-line of *Scotland Oversea*; but this deflection is much slighter than in Ptolemy, and only occurs in the best copies, the King's Library example being entirely free from it. Both the Roman walls are given, coloured yellow like the mountains; the sea on the west and east of Britain is green, like all the bays, gulfs, and lakes; to the north, the ocean, "most vast and impassable," has been left uncoloured; the rivers are blue or red, like some of the shire-divisions; while place-names and inscriptions are by turns red or black.

Within a space measuring 33·8 by 22·3 centimetres, an enormous amount of detail has been crowded. As to the contour, it is so good that any one at the present day would recognize it as pretty near the truth; the orientation is also remarkable. For here we have, for the first time in Northern Europe, a map with the *north* at the top and the east to the right; and in this we may see a victory of revived scientific feeling over the ecclesiastical preference for the *east*, and of North-European feeling over the Arabic and 'meridional' influence which had made the *south* the primary cause of the heavens. But the Ptolemaic arrangement, now reproduced by Matthew, was also better adapted for a sketch of the long and narrow island of Britain tapering towards the north,* and hence perhaps its victory in this instance.

(c) The 'Situs' and the 'Schema (Britanniae)' are works of much slighter interest; the former has been already noticed, and needs no further attention; the latter, though merely a sketch of the four chief Roman roads of England, is peculiar in its orientation, Britain being, as it were, placed on end, with the *west* at the top. The Watling Street, the Fosse Way, and the Ermin and Icknield Roads are made to intersect at Dunstable.

(d) Matthew's 'Itinerary from London to the Holy Land,' as it is called, with which has usually been reckoned his map of Palestine, concludes the examples of this writer's draughtsmanship. But the Itinerary does not really exist as a connected whole; it is only the result of combining two parts which are not always in exact agreement. On one side we have, in various manuscripts of Matthew, a pictorial representation of the chief stations, or stopping-places, between London and Apulia in Lower Italy; these stations are all figured in sections from north to south, the chief rivers and mountains to be crossed *en route* also appearing; on the other side, we have a map of Palestine with the east at the top, entirely agreeing with the customary delineations on mediæval world-maps. The latter has really no connection with the former, except that both are by Matthew Paris, that

* It may be noticed that the Anonymous Geographer of Ravenna (seventh century) claims to have composed a special map of Britain, as well as his mappemonde, and this also is said to have had the north at the top.

both are of almost the same date, and that both are written in Old French intermixed with Latin.

But if the Itinerary to Apulia cannot be explained as part of a Pilgrim Guide to the Holy Land, what is its origin? Probably as follows. On St. Martin's Day, 1252, one Master Albert appeared at the English Court, and offered to Earl Richard of Cornwall the kingdom of Apulia on behalf of Pope Innocent IV., titular overlord of that realm. The Earl himself looked on the gift as a "dominion in the moon;" but his brother King Henry III. and the English court party were eager to accept the offer; and this itinerary was probably composed during the abortive negotiations on the matter. Its object was, therefore, political rather than religious, for it aimed at fomenting and informing English ambitions as directed on South Italy. This is further shown by the fact that the Itinerary proper only reaches as far as Rome; at this point it takes a new departure, and portrays the Norman lands south of Rome (the *Pouille*, or Apulia of the map) in a detailed form, enumerating all the greater towns. No list of stations is given from South Italy onwards to the Holy Land, and it is pretty clear that none was intended. Two inscriptions of interest occur; against *Pouille* the whole story of Pope Innocent's offer is recorded; another legend at Trapes,* in Sicily, tells how the same Earl Richard of Cornwall called at this place on his return in 1241 from a crusade.

(e) Matthew Paris' map of Palestine, so naturally, if mistakenly, connected with the Itinerary just noticed, is in some respects parallel to the smaller Jerome map. Both have Palestine in the middle and Egypt on the right; both make the east the primary quarter; but in their details they are very different. For Jerome gives us ancient names throughout, while Matthew Paris inserts many indications of thirteenth-century nomenclature and history (c. 1250). The author adds some vague marks of roads, a picture symbolical of Syrian trade, and sketches of the fortress-enclosures of various western corporations in Acre. The chief of these are the Templars, the Hospitallers, the Teutonic knights, the Genoese, and the Pisans; and this assignment exactly agrees with the position of things in Matthew's time. For Acre was now (1229-1291) the capital and the only important relic of the Latin kingdom of Jerusalem. The legend in the north, "Far towards Boreas dwells the old man of the mountain," is another contemporary touch. For the "Assassins," perhaps so named from their Hashish-smoking, still survived in Matthew's time, and were not finally destroyed till 1256, when the Mongols exterminated them.†

* Trapani.

† The sect was of Shi'ah tenets, supported the Fatimite Khalifs, and made war impartially on Christians and Abbasside Mohammedans. Their founder, Hasan Ibn Saba, c. 1090 took up his residence in the Lebanon, and hence was named "Shaikh El Jebel," chief, or elder ("old man"), of the mountain. It is quite possible that Matthew, who died in 1259, had not heard of the ruin of the Assassins in 1256.

The picture of the camel and its driver, representing the Levantine trade of the thirteenth century, recalls somewhat similar things in the maps of Ebstorf and Hereford.

Like Matthew's World-map, this sectional 'Palestine' (in sharp contrast to his 'England') has the traditional outlines of the ordinary mediæval map. On the other hand, its text (as in the other works of this author) is for the most part new, and stands in close relation to the itineraries of the period of the Latin Kingdom in Syria. Three of these are plausibly suggested by Konrad Miller as sources of Matthew's Levantine knowledge: "*Les Pèlerinages pour aller en Jérusalem*," "*Les chemins et les pèlerinages de la Terre Sainte*," and "*La dévise des chemins de Babiloine*" (i.e. Babylon of Egypt). The first of these is of 1231, the second of 1265, the third of 1289-1291; but it is probable that earlier redactions of the two latter already existed in Matthew's time, and were used by him before 1259. Thus '*La Dévise*,' which is of course a description of Egypt, mentions the arm of the river "which the people of the King of France passed over," and herein appears to refer to the crusade of 1251, led by Louis IX.

II. (a) Some have thought that Matthew Paris, in the northern part of his map of Palestine, makes use of an older map; but this does not appear, as has been rashly stated, from a comparison of Matthew's sketch with the famous Plan of Jerusalem, or '*Situs Hierusalem*' of the earlier crusading period. This plan has come down to us, in various copies, from the opening years of the twelfth century; and one* of these copies seems to have been sketched by the anonymous compiler of the '*Gesta Francorum*.' Professedly, but not literally, the '*Gesta*' follows the narrative of Fulcher of Chartres, who described the first crusade as an eye-witness. The text of the '*Gesta*' was probably finished before 1109; it is sometimes in close agreement with Fulcher, and at other times with the '*Situs Hierusalem*;' but where the '*Gesta*' and the '*Situs*' agree, their content is distinctly different from Fulcher. Here, also, the '*Situs*' is clearly the original and the '*Gesta*' the derivative; for the material of the sketch, in relation to the Holy City itself, is far more ample, and some of its most curious inscriptions are not referred to in the '*Deeds of the Franks who took Jerusalem*.'

(b) Along with the '*Situs Hierusalem*' has been usually taken the famous tract, '*Qualiter sita est Civitas Hierusalem*,' which has been supposed to be a paraphrase of the material contained in the Plan of Jerusalem just described. It is probable, however, that Tobler and Molinier are right in referring this pamphlet to the period before the first Crusade, and in suggesting the date of about A.D. 975, the era of the brief reconquest of the Holy City by the Byzantines under John Tzimiskes. In any case, the tract is properly independent of the '*Gesta Francorum*,'

* That of St. Omer.

but is in some respects related to the original 'Situs.' Assuming the earlier authorship of the pamphlet, the draughtsman of the Plan of Jerusalem must have made use of the written description of Tzimiskes' time; while the author of the 'Gesta,' ignorant of the tract, is yet indebted to the same through the medium of the sketch,* which he uses and transcribes.

Eight copies of the 'Situs' are known, of which three are well known, those, namely, at St. Omer, at Brussels, and at Copenhagen. The first of these is of the twelfth century, and belongs to a manuscript containing the anonymous 'Gesta Francorum' already noticed. The second or Brussels copy is bound up with the crusading records of Fulcher of Chartres. This example, like the former, depicts at the top of the sheet the whole course of the Jordan, with a number of other place-names taken from, or at least agreeing with, the ordinary mediaeval descriptions of Jerusalem, but sometimes in unusual positions. The reason of these apparent errors lies perhaps in the fact that the 'Situs' is but a section of a more extensive original, and that into this section have been crowded place-names and sketches from other portions of the larger map. Thus, besides the upper Jordan and certain places of Galilee, we have—placed in the immediate neighbourhood of Jerusalem—various indications of the Way of the Israelites from Egypt through the desert.

The Copenhagen copy, from an Icelandic manuscript of the thirteenth century, has lost all these traces of a wider outlook. Even the surroundings of Jerusalem are here wanting; and various additions have been made, which are clearly of later date than the first crusade. Lastly, the Temple and Sepulchre of the Lord have lost the round form which appears in the earlier copies of the 'Situs,' and which refers us to the buildings of the pre-crusading period. Among other copies of this plan, the twelfth-century Stuttgart is probably a copy of the Brussels manuscript; the Cambrai example, of about the same date, is square in form, like the Montpelier of the fourteenth century, and offers various peculiarities; the London design, of about 1200, and Count Riant's thirteenth-century copy, conclude the list. The last-named is perhaps from a Florentine manuscript of earlier date than any now surviving. The city of 'Masphat,' which here is both pictured and named, appears without inscription on our other copies, which are all executed with less care and elaboration than this one. Some of its legends outside Jerusalem are apparently additions of the copyist, and recall the twelfth-century pilgrim, John of Würzburg.

III. Another plan† of the Holy City and its environs, of far earlier

* The 'Situs.'

† The best study of this is by Germer-Durand, 'La carte mosaïque de Madaba' (Paris, 1897). See also K. Miller, 'Rekonstruierte Karten, Anhang,' pp. 148-154; and Lagrange, 'Revue Biblique' (1897), vi. B., pp. 165-184.

date, has recently been discovered; and though no clear connection can be traced between the details of this plan and those of the 'Situs,' of Matthew Paris, or of the tract 'On the Situation of Jerusalem,' yet it would not be right to leave out all reference in this place to the mosaic map of Madaba. The work in question is one from the best age of Byzantine art, the period of Justinian, and it may therefore claim to be the oldest existing specimen of a Christian map; for its date of about A.D. 560 clearly precedes by a good two hundred years that of the Albi map (A.D. 750); and though the original designs of Kosmas Indicopleustes must have been executed twenty or thirty years earlier than this mosaic, the oldest manuscript we possess of the 'Christian Topography' does not carry us back further than the ninth century. Moreover, Kosmas' map-sketches are mostly limited to the Florentine manuscript of the tenth century. Compared with the latter, the Madaba mosaic is of much greater merit, as far as we can judge from its broken and damaged state; it is not unworthy of the reign of the Restorer of the Empire; and it increases our regret for the loss of so much Byzantine work in this as in other fields. However, the Madaba map is only concerned with Palestine and parts of Egypt and Arabia; its special subject is the Holy City itself; and here it probably reproduces the exact state of Jerusalem about 560, half a century before the Persian capture and sack of 614. Madaba, the Biblical 'Medeba,' the 'Medaba' of various writers of the later imperial time, lies east of the Dead sea, a little south of Heshbon, south-east of Nebo, or Pisgah, and on the Roman road which ran from Damascus to Petra and the Red sea. It was also close to another Roman road, which, coming from Jericho and running eastwards to the edge of the desert, crossed the former, or Damascus-Petra, road at Heshbon. Once it belonged to the tribe of Reuben; it is mentioned by Josephus, Ptolemy, and Stephanus of Byzantium; and from the fourth century till the Moslem invasion it was the seat of a Christian bishop. No further interest attaches to it till, in 1880, the Syrian Christians of Kerak were obliged to leave their old home, and so migrated to Madaba. They cleared away the rubbish from the place where they began their new buildings, and discovered under the soil hewn stones, pieces of mosaic flooring, and fragments of pillars. In December, 1896, a fragmentary map-picture was found in this mosaic. The extension of the design is somewhat similar to the smaller Jerome map, where Neapolis, or Nablûs, lies in the middle, and where the Mediterranean forms the western limit. In its pictorial character, and especially in its town-vignettes, the Madaba plan also recalls one of the Beatus copies (that known as Paris III.), which gives us a number of cities showing no resemblance to the representations of a flat design, but much to those of a plan in mosaic. In the Madaba city-pictures we may also see an obvious likeness to the towns of the great Roman road-maps, such as the Peutinger Table.

The mountains of Palestine are here marked by variegated lines. The Dead sea is remarkable for its exaggerated size, its blue wave-lines, and the two large ships that float on its waters. In the Jordan and the Nile are several fish. A piece of the Arabian gulf is indicated in the extreme south. In the desert fringing Palestine and Egypt the oases are marked by palms, around which lions (?) are chasing gazelles. Among other features, the Serbonian Bog is marked between Palestine and Egypt. Near the meeting-place of Philip and the Ethiopian is the oak of Mamre; the springs of Kalirrhoe are also marked; and a ship lies in the lower Jordan, with an enormous cross-piece to its mast, looking like a bridge over the river. The delta of the Nile is well shown. But the city-pictures are by far the most important features on this map; some of them seem rather fantastic, but in general they appear to correspond pretty well to fact. That of Jerusalem, in particular, seems to preserve a true outline of the chief buildings of the Holy City, as they stood before the destruction of A.D. 614. In any case this is one of the oldest pictures yet discovered of Jerusalem outside the Assyrian and Egyptian monuments.

The Madaba map has only been recovered in fragments; hence we can only conjecture, though with great probability, that its object was primarily to show the division of the Twelve Tribes of Israel. It was, of course, designed for the pavement of a church, and is strictly ecclesiastical in type. Its notice of the monastery of St. Sapsas,* on the east bank of Jordan, refers to a foundation of the early sixth century; most of the other names (in all 130) correspond with places mentioned in Eusebius's 'Onomasticon,' but some of them are not otherwise known, and occasionally older and newer forms are given together.

METHODS OF SURVEY EMPLOYED BY THE CHILEAN BOUNDARY COMMISSIONS IN THE CORDILLERA OF THE ANDES.†

By Prof. A. BERTRAND (University of Santiago, Chile).

THE purpose of the present article is merely to draw the attention of those who are interested in the processes by which the geographical knowledge of the Earth is obtained, to some practical means employed by us, that a large experience has proved to be very successful—more successful, indeed, than we hoped for when we first began to apply them. I do not claim for any of our processes the merit of invention or even of novelty, but only that of having been employed to a very large extent, and with very rapid and fairly precise results, where the usual processes would have occasioned a longer delay and produced only geographical sketches, with the resources at our disposal.

* Or Sapsaphas, a contemporary of Elias, Patriarch of Jerusalem, A.D. 491-518.

† Read at the Royal Geographical Society, Afternoon Meeting, March 27, 1900.

The main and distinctive features involved in our processes of survey of the Cordillera of the Andes to which I allude are—

1. The substitution of a polygonal network along the Cordillera valleys for the usual triangular network over the summits.

2. The peculiar long-range telemetrical measurement of each side of the polygonal perimeter.

3. The fixing of the true bearing of the sides by the exclusive observations of the maxima digressions of circumpolar stars.

4. The checking of the positions of crossing-points by their latitudes, obtained exclusively by observations of differences of zenithal distances with small and transportable instruments.

5. The checking of the positions of important points of the different polygons, in longitude, by means of the electric telegraph, and occasionally of secondary points by star occultations.

6. The suitable preparation on printed forms and drawn maps or diagrams of all the elements needed for observing, calculating, or drawing of the results of the survey.

Before going into details, I should, perhaps, say something about the extent and purposes of the survey I am speaking of. This survey has been entered into on our side as an accessory to the marking out on the ground of the boundary-line agreed to by treaty between my country, Chile, and the Argentine Republic, not confining, however, our survey to the ground close to the boundary-line; on the contrary, we have taken an especial care to start operations at geographically determined points of the central part of our country, and when it has been necessary or convenient, of the Pacific coast, so as to maintain a geographical connection between the different parts constituting the survey.

As to its extent, our survey will embrace when completed, along the Cordillera of the Andes, nearly 2000 miles from north to south, between the 23rd and 52nd parallels of south latitude, on a nearly meridional line confined between the 67th and 74th meridians west of Greenwich.

TOPOGRAPHICAL WORK.

No ground could be, apparently, better adapted to the usual method of trigonometrical surveying than the Cordillera of the Andes, as the numerous summits of its various chains or ranges, once reached, could leave nothing to be desired as trigonometrical stations. It becomes, then, necessary to explain why preference has been given by us to a polygonal network over a trigonometrical network in this case.

The explanation is simple enough, and lies in the comparison between the two following statements:—

Triangulation is a special work, carried on by the summits of the hills, and requiring an ascent to each station, an ascent that is the more difficult in proportion to the bad condition, scarcity, or absolute non-existence of roads or paths to reach the tops. Besides, the location of stations on hilltops leave them exposed to the fierce winds that on the Andes blow every day, especially in the afternoon, with such a terrific force as to often absolutely prevent the carrying out of any surveying operation.

Polygonation, or geodetic traverse-work, as it should be called here, is, on the other hand, an operation that may be easily carried on by the bottom of valleys, as the soil in the valleys or paths already existent, and without interfering with, or detracting in much, the purposes of the journey that is being made by a party, whatever else might be its object.

This was precisely the case with the Chilean Boundary Commissions. They were ordered to mark out as a boundary-line the water-parting line of the Andes, which, like all water-parting lines, may be easily found in almost all cases by mere ocular inspection, without requiring any preliminary survey of the ground. As the commissions were instructed, however, to carry on such a survey as a subsidiary operation without unduly delaying the demarcation of the boundary, and with the chief purpose of showing on a map the real configuration of the ground along and at both sides of the boundary-line, it was deemed advisable to select a method the results of which might be relied upon, not only for the purpose alluded to, but also for the more generally useful one of providing a map composed of parts geodetically connected with one another, and with the settled and already surveyed part of Chile. The method of polygonation, besides being the more expeditious, offered the additional advantage of supplying at once a horizontal map and a vertical section of every Cordilleran valley where the route of the expedition would pass, laying in this wise an efficient basis for the future opening and construction of roads on that difficult ground.

To make thoroughly understood the practical importance of all the circumstances that have been mentioned, we might perhaps insist a little more on the material difficulties attending the execution of a proper geodetic triangulation in the Andes. In the first place, it must be borne in mind that each commission, composed of three or four surveyors and perhaps ten to twenty attendants, has to be equipped once for each season—that is, four to six months, during which they have no communication whatever, but by special messenger, with the civilized world. Each commission then starts at the beginning of the season, with the proper number of horses and mules for pack and saddle, and those animals, which frequently get but poor pastures, have to last through all the season without possibility of being relieved or exchanged. Now, in order to carry up the surveyors, their attendants, and instruments to the top, or even near the top, of the high hills that must be selected as geodetic stations would require a supply of beasts of burden hardly compatible with the desirable mobility of the camp. Either these hills are bare and their slopes covered with disintegrated rock on which the hoofs of the animals have little hold, or they are clothed, up to a certain height, with forests or brushwood through which there is absolutely no path. Those difficulties are not, of course, impossibilities, but the work and the expense of surmounting them would have been absolutely out of proportion with the actual usefulness of the result that might have been obtained.

On the other side, the polygonal method permitted, as has already been stated, the carrying on of the operations of the survey along the route of each expedition, and did not require of the pack and animals much greater work than would be necessary for the mere marking out of the boundary.

At the same time, it was not overlooked that the results of barely applying the usual topographical traverse survey method would have been very deficient, and it devolved on me to devise such modifications and adaptations of other methods as could give to our results a geodetic value.

I will now proceed to show, as briefly as possible, how this has been attained.

MEASUREMENT OF THE SIDES.

As it is well known, the usual methods for the measurement of the sides in topographical traverse work are: (1) the direct measurement by chains or steel tapes, from 60 to 150 feet long; (2) the indirect method, by the transit and stadia, otherwise called tacheometry. In the first case there is no other limit to the length of the sides than the material possibilities of a measure in straight line; in the

second case, however, the length of the sides cannot be measured with anything like accuracy, beyond 1500 feet.

In fact, by any of those methods, and taking into account the very tortuous shape of our Andine valleys, the sides would have been very short, and consequently a very great number of turning-points required for reaching the summit of the Andes from the centre of Chile. Now this multiplicity of stations entails, on one hand, the probability of accumulation in angular errors, and, on the other, a danger of increase in each individual error, on account of the defective centration of instruments and signals being the more sensible for short distances.

Moreover, the direct measure would have been, in many cases, impossible where the paths run alongside of tortuous cliffs, or amidst tangled bushes, or similar obstacles.

The method that we have actually employed is based on the same geometrical principle as ordinary tacheometry. This well-known principle rests on the resolution of a very acute triangle, the summit of which is at the observer, its small side being commonly measured on a wooden staff, from 12 to 15 feet along. For long ranges, say 1500 feet, fixed-length staffs are used, and the small (diastimetrical) angle at the summit is measured micrometrically, usually by a micrometer attached to the instrument.

Now, we have replaced the wooden vertical staff by a nearly horizontal steel tape or wire, 100 metres long, the extremities of which are made visible by signal flags, and we measure the diastimetrical angle at the summit, on the horizontal limb of an ordinary 5 or 6 inch transit theodolite. The range of length of the sides is thus increased indefinitely, as, when the ground is suitable, the base may be extended to 200 or 300 metres, or, better still, a small triangulation may be carried out at one end of the side, and any two suitable points nearly at right angles with the side may be selected to form a base. In this wise sides of 10 to 15 miles have been measured with very little trouble and good accuracy.

It is plain that, to obtain exact results by this method, only two things are necessary—a very exact measurement of the base, and a very exact measurement of the diastimetrical angle.

Setting aside, for the present, the less important elements of the question, I will now proceed to explain how those two kinds of measurements have been effected in our case.

THE 100-METRE APPARATUS.

This is simply a steel wire, about 102 metres long, weighing under two pounds, near both ends of which are soldered two small slotted brass plates; the distance between the slots being exactly 100 metres, when the wire is freely suspended by both extremities, without any intermediary resting-point, and under a given pulling strain (about thirty pounds), at a temperature of 60° Fahr. The wire is held in place by two assistants by means of suitable handles, and, when not in use, is rolled on a wooden reel.

The wires we are using have been prepared by the surveyors themselves, at our Boundary Office, where standards have been laid down, by means of a 100-metre steel tape previously controlled at the Geodetic Survey Office at Washington. The proper tension is obtained by means of an ordinary spring balance.

Under these conditions the light 100-metre wire allows the two signal flags to be set at that exact distance, no matter how broken the ground may be, even with a brook or torrent rushing between. Then, it presents very little surface to the wind, and it must be observed that the accuracy of the measure is in no way affected on this score, provided the proper tension is kept, as it does not matter in the least

whether that tension is produced by gravity alone, or a part of it is due to the wind.

The 100-metre base gives a diastimetrical angle of more than 2° up to 2500 metres, and may be safely used up to 5000 metres. For longer sides, if the ground allows it, bases two wires long may be measured, or a longer one calculated as a side, a diastimetrical angle being measured at one end, and the 100-metre wire stretched at the other. Both methods have been employed with good results.

THE DIASTIMETRICAL ANGLE.

I have already stated that our diastimetrical angles are measured on the horizontal limb of a theodolite, rather than by any micrometrical device. Preference has not been given to the former method without trial, and though it would perhaps be tiresome to explain at full length the reasons that have determined such a preference, the chief may be summed up as follows:—

By measuring the small angle on different parts, symmetrically distributed, the angular measure may be brought down to any required degree of accuracy, eliminating, within the required limits, all the instrumental and observation errors. That result cannot be secured with a micrometer, especially as regards the errors arising from observation of images produced outside of the optical axis of a telescope, as is always the case with micrometrical measures.

Besides, a micrometer is a very delicate and undesirable adjunct to a field theodolite, and is liable to get out of order, as a consequence of the rough handling to which those instruments are sometimes unavoidably subjected. To anybody wishing to ascertain by himself the capacities of the micrometer and the horizontal circle, on a given theodolite, I should suggest a practical test with a known angle, by both devices.*

To bring down the measure of each side to a given standard of accuracy, it would be necessary to determine previously the number of repetitions of the angle that would be required, in view of the value of the angle, and of the length, yet unknown, of the side. This, of course, could be roughly estimated, or obtained by a preliminary calculation. But, for all practical purposes, we have deemed it sufficient to increase the number of repetitions in inverse ratio to the size of the angle, from two repetitions for 5° up to six repetitions for $\frac{1}{3}^\circ$.

CALCULATION OF THE SIDES.

The accurate measures of the base-line and of the diastimetrical angle are, as already stated, the chief elements of this calculation. Less important measures are also made, with a lesser degree of accuracy, of the angles formed by the base-line with the polygonal side, and with the horizontal line, as well as readings of the barometer and thermometer. The latter are used only to effect corrections on the calculated base length, to reduce it to the standard temperature of 60° , and to sea-level. These corrections are previously tabulated.

The calculation itself involves only the sum of four logarithms, and is carried on on printed forms.

Perhaps I might point out that a check on the length of each side could easily be obtained, taking successively each of its extremities as a summit for a diastimetrical angle; but in practice, with closed polygons, this has not been found necessary.

* The superiority of the horizontal circle over the micrometer for measuring small angles has been maintained, I find, by Colonel Tanner, in an article entitled "Bar Subtense Surveys," in *Proc. R.G.S.*, 1891, p. 675.

The angles between two consecutive sides are measured by means of a common transit, to which is attached a long needle compass. At every station the line 6°-104° of the horizontal limb is made to coincide with the magnetic meridian, and independent readings are then made in the direction of each side, the value of the interior angle being found by differences. The operation is repeated; the line 60°-210° being this time in coincidence with the magnetic meridian. In every case readings are made in the direct and reverse positions of the telescope.

POLYGONAL NETWORK.

When all the polygonal units of a season's work are put together, due consideration is given to the latitudes astronomically determined at the principal points, and a final adjustment is made of the whole, implying usually very small corrections, but effectively preventing the accumulation of errors and their propagation from one section of the work to the others.

This has been carried out simultaneously with the surveying operations on the usual lines—that is to say, by reciprocal zenithal distances for the station points, and by single zenithal distances for the outside billtops. Suitable tables for correcting the refraction have been provided in the latter case, showing a new index of refraction to be introduced, if necessary, at very great altitudes. Beyond this I have nothing of particular interest to mention in connection with this part of our work.

I have already stated the foregoing to the effect that the above named persons have been interviewed and that the results of the interview have been reported to the Bureau. The results of the interview have been reported to the Bureau and the Bureau has been advised of the results of the interview.

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pole, and the consequent impossibility of recurring to any of the methods of observation on the Pole-star so popular in the northern hemisphere, have led to our selecting other methods, already well known to professional people, but to the practice of which we think we have contributed some sensible improvements in connection with the use of portable instruments.

The almost constant and often violent winds that blow on the heights of the Andes and on the high bare plains of Patagonia, interfere very seriously with the setting of the portable instruments, and even more with the usual method of lighting the ocular field of the telescope by means of a small oil-lamp. This difficulty is increased when it becomes necessary to observe the smallest stars visible with the telescope, as a very faint and steady light is then required.

Finally, the fact of the observers having to move and work almost without any rest during the daytime, makes it imperative that their necessary repose at night should not be interfered with; or, to put it in other terms, that the observations must be made in the short interval between dusk and bedtime.

On these somewhat restricted lines we had to adjust our selection of methods and instruments. As I have said before, I do not claim for either of them the merit of novelty; still, although these methods are at present largely practised, I am not aware that their practical possibilities have been tried in the methodical way adopted by us, or that their full capacity in point of facility of observation, elimination of errors, and simplicity of calculation, has been fully realized before.

THE INSTRUMENTS.

With the exception of a special instrument, that will be described further on, we have used almost exclusively Troughton and Simms's transit theodolites, the 5-inch transit for traverse work only, and the 6-inch, with the addition of a sensitive level attached to the vernier-plate of the vertical circle, for both astronomical observations and geodetic traverse. The latter has also been supplied with an electric-light attachment, consisting of a dry-cell battery and two minute bulb-lamps, one for the inside of the telescope and the other for the readings.

I ought to observe, by the way, that a perfect dry cell has yet to be invented, as far as I know. We have always found it necessary to carry with us the common oil-lamp attachment in anticipation of the electric plant refusing to work properly. Still, defective and liable to fail unexpectedly as they are, they have been most valuable adjuncts, and a good deal of astronomical work, especially with the fourth and fifth magnitude stars, have been carried out amidst strong winds, that would not have allowed a steady light with the oil-lamp.

ELEMENTS OF OBSERVATION.

For the reasons already explained, as well as with a view to the requirements of the methods employed, it was deemed of the utmost importance that the observations could be made on any star, visible with the faintest illumination of the wires, and in good position for observing during some two or three hours after dusk. As the English and French ephemerides do not supply the number of required stars, our first step was to have prepared and printed a field catalogue of southern stars, down to the fifth magnitude, these being usually observable on moonless nights, in the clear atmosphere of our cordilleras, with the 8-inch telescopes of our theodolites.

For this purpose I selected, out of the very valuable 'Stone Catalogue of Southern Stars,' prepared at the Cape observatory, all the stars of and over the fifth magnitude between the South pole and the twelfth degree of northern declination; the number of stars thus obtained amounted to 818, more than two-thirds

of which were not contained (in 1897) in any current ephemeris, so that transit observations could be taken, on an average, every two minutes.

Without dwelling on the arrangement of the catalogue, I will only make the remark that I thought it advisable, when it was printed three years ago, to bring down the mean places of stars to the epoch of the present year, 1900, as our work was rightly presumed to extend as much after as before that time. Moreover, this implied also some simplification of the computations, as the epoch of the *Stone Catalogue* is 1880, and all corrections could then be applied for a twenty-years' interval. I may also mention that, to avoid useless calculations, the names of stars included either in the English or French ephemerides have been printed in bold type, so that, when observed, their position for the day might be directly taken from these publications.

The use of our *Field Catalogue* is further facilitated by that of a star map, specially drawn, and showing the 818 stars contained in the catalogue.

METHODS OF OBSERVATION.

In the selection of our methods of observation, we have been guided by a general principle that we think ought never to be disregarded when reliable results are required, either astronomical or belonging to any other branch of experimental science. This principle may be stated in, so to say, an axiomatic form, viz. that, in order that the results obtained by a given method of observation may be called reliable, that is, in a certain measure free from errors, such method must provide for the systematic elimination of all the errors that may be involved, either in the elements of observation given as data of the question, or in the instruments employed, or in the peculiar conditions under which the observer may be labouring.

For instance, to quote a well-known case, suppose the latitude of a place to be determined by a given number of culminations of stars. However great the number of culminations observed may be, and however careful the setting of the instrument, if all the observations have been made on stars culminating on the same side of the zenith, and in the same position of the instrument, the final result will not be free of certain systematical errors. Any fault of horizontality in the initial position of the axis of collimation will affect equally all the results; any systematical error in the declinations given for the observed stars will also be transmitted to the results in their integrity; finally, all errors due to the actual index of refraction not being (at the place of observation) exactly the same as that assumed for the computation of the tables, will also affect the result without any possibility of attenuation.

Now, on the other hand, suppose that half of the culminations observed take place to the north, and the other half to the south of the zenith; then all systematic errors in star declinations, all errors due to vertical collimation, will affect with contrary signs each half of the results, and will, consequently, be more or less eliminated. If, in addition, the telescope is reversed for every other observation taken on each side of the zenith, more instrumental errors will be eliminated. Finally, if the stars are grouped in pairs in such a way that the two stars of every pair culminate on different sides of the zenith and at nearly the same distance from it, then all errors due to refraction will also be eliminated.

Once the systematic errors as nearly as possible eliminated by the application of the principle just illustrated, the importance and probable value of accidental errors may be ascertained by the usual method of the least squares, and the true scientific value of each result may then be known, and accordingly made use of.

Together with the foregoing scientific principle another of a merely practical

kind might be quoted as one that previous experience had enabled us to test thoroughly. It is to the effect that when a large number of observations, involving necessarily a much larger number of calculations, are to be made, the utmost care and ingenuity must be displayed in preparing, down to its minor details, the methodical arrangement of the several operations involved. All the time and all the labour thus employed in the laying down of the work as a whole will be amply repaid by the saving of it in each individual operation. I proceed now to give some particulars as to the methods employed by us for each kind of observation.

Latitude.—The outline of the method by small differences of zenithal distances of stars at their culmination on both sides of the zenith, has already been given in the example we have quoted; this method is also recommended in the 'Hints to Travellers,' where it is briefly described. The idea of employing exclusively this method with a common transit for the accurate and systematic determination of latitudes occurred to me when studying the results obtained by Talcott's method with the zenith telescope. I thought then that the main advantages of the method could be secured in a reasonable measure, without the need of a special and cumbersome instrument, provided a much larger number of stars than those supplied by the Ephemeris could be observed, and all the preparatory work that could be done before was previously executed at the office, and as little as possible left to the observer. The subsequent experience has proved that I was right. The practice of the operations in our case is as follows:—

Supposing the latitude of the place to be known within a few minutes, as well as the local time within a few seconds, results that may be obtained by a noon or other simple observation, the first thing is to draw up a list of the catalogue stars culminating after dark, say during three hours, and arrange them in pairs, culminating one north, one south of the zenith at equal distances, within one or two degrees, and within an interval of time not exceeding, say, fifteen minutes. This preparatory list is easily made with the aid of the star map, where the trajectory of the zenith may be drawn, and the pairs of stars selected by sight or with a scale of minutes. It is always possible to have more than two pairs of stars, and frequently as many as eight or ten in two or three hours.

Printed forms are then filled with the necessary data for the observations during the stay at the station, viz. the names of the stars, the time of culmination, the approximate settings of the vertical circle in its two positions; these data being calculated in view of those of the catalogue and the approximate latitude. This first form may be prepared some days before that on which the observations are to begin, provided the rate of the chronometer or watch is known. A good common watch, such as are used by enginemen, is well suited for the purpose.

Just before making the observations, if the night is clear, the pairs to be observed on that particular night, as well as the setting of the vertical circle in the position (right or left) in which it is to be read for each pair, may be inscribed on the observation form, together with the watch times for each observation. If the weather is cloudy, it is better to wait till a few minutes before each culmination, so as to see if there is any chance of taking the observation, before making the entries.

The instrument ought to be set in the day time, when a stake is also set, some hundreds of feet off, in the direction of the meridian, approximately obtained by the compass and the knowledge of its variation. The stake is very convenient for ascertaining again the direction of the meridian, and resetting the theodolite in case of its having been disturbed by accident.

With respect to the setting of the vertical circle, we should observe that, when

possible, the difference of zenith distance between the two stars of each pair ought not to exceed the run of the tangent screw, in which case the vertical circle may be set midway between the two readings, and these may then be observed without loosening the clamp screw.

All being ready, each star is looked for, a little to the east of the meridian, some minutes before its culmination, and, when found, is kept on the horizontal wire by means of the tangent screw until the culmination. The observer must keep his eye on the sensitive level, and make a record of the readings as near as possible at the moment of culmination; the readings of both verniers are also recorded. Finally, readings of the thermometer and barometer for corrections of refraction are also made once for each night.

The importance of the latitude being known beforehand with fair accuracy is apparent; otherwise, when small stars are observed, a wrong one might easily be sighted. It is also convenient as a means of avoiding too much difference between the prepared settings and the registered readings.

In working out the results of the observations, an additional check is obtained on the accuracy of the result, as one value for latitude is deduced from each culmination, the average being taken, and another value is calculated by the formula for difference of zenith distances, where differential refraction is introduced. The whole computation does not require above ten minutes for each pair of stars.

Though this kind of latitude observation is not necessarily confined to the theodolite, and may be practised with the sextant, the results are not so good, unless for a specially trained observer, as it is rather difficult to identify small stars with this instrument; indeed, it is then almost impossible to observe any but the brightest stars.

On the other hand, when a very large amount of latitude work is to be undertaken, better accuracy than with a 6-inch theodolite may be obtained, if the expense of a special instrument is admissible, by means of a small portable instrument that I have devised and called "zenith sector."

The essential parts of this instrument are: (1) a fixed brass quadrant divided into whole degrees; at any point of this may be set the second part; (2) a movable 5° sector, 8-inch radius, with vernier attachment reading to 5"; (3) a fixed focus telescope with a long diagonal eye-piece, lighted internally by a small electric bulb; (4) a sensitive level with 5" divisions, set on a first horizontal plate which rests, by means of three fine-thread screws on the next part; (5) a base plate, with common levelling-screws and an horizontal limb divided in whole degrees; and, finally (6) a solid steel-braced stand, low enough for the observer to be in a sitting position.

There are at present three of these instruments in use with our boundary commissions; they are of little weight, easy to set in position, and allow more comfort for the observer than the theodolite. The accuracy of the first of these zenith-sectors, constructed in 1886 by Troughton & Simms, was tested at the Santiago Observatory, with the following results:—

Date	Time	Predicted error	Actual error
November 24, 1886	5	2.9"	2.5"
" 25	5	2.4"	2.4"
" 26	6	2.3"	2.3"
December 1	6	2.4"	2.7"
" 2	6	2.4"	2.3"
Average	6	2.4"	2.4"

These results show that, by the observations of six to eight pairs of stars with the zenith sector in a single night and in good conditions, an accuracy within 1" may be obtained. In field practice, as it might be expected, the range is a little wider, as single errors of so much as 10" are incurred, when a very strong wind is blowing, or other unfavourable circumstances occur. Still, the 1" accuracy is usually attained by ten to twelve pairs.

With the 6-inch theodolite, about half as much accuracy as with the zenith-sector is attained.

Before finally leaving the subject of the latitude, we ought perhaps to make some remarks about two causes of error that cannot be eliminated or compensated. In fact, rather than errors, they should be called effective discrepancies between the astronomical and geodetical latitude of a given place. The causes to which we allude are the attraction of mountain masses and the variability of the polar axis of the Earth. Owing to the first cause, the plumb-line is deviated from the vertical direction, and consequently the apparent zenith is shifted to one side of the true zenith; as a further consequence, all arc measurements made on vertical limbs of instruments are thereby affected. The range of errors or differences arising from this cause in a mountainous country is much larger than the range of accuracy attained in our determination of latitudes, as it amounts sometimes to 10" and more. It has happened that the difference between the astronomically determined latitudes of two places, only separated by a high range of mountains, has exceeded the true difference obtained by direct measurement by as much as 25".

As to the error in latitude caused by the shifting of the terrestrial axis, it never exceeds $\frac{1}{2}$ "; it may only be mentioned as accounting for small differences in latitude determinations of the same place, made at different times of the year.

Azimuth.—The same principles that have led to the observing of stars at their culminations on both sides of the zenith for determining latitude, have also held good for the observation of stars at their elongations (or maximum digressions) on both sides of the meridian for azimuth.

This refers not only to the elimination of errors, and to the preparation of the elements of observation, but also to the fact that in both cases the observations are not instantaneous, and that the time element, so difficult to be relied upon in field practice, only comes in as a finder, and is not introduced in the calculations.

There is, however, a strong dissimilarity between the two cases, respecting the possibilities of observation, that should be pointed out before going on. Every star is bound to have a culmination, that is, a retrocession in the sense of altitude, and, if visible at that moment, is available for observation without more restrictions than to avoid low altitudes on account of refraction. On the other hand, every star does not necessarily pass by an elongation or retrocession in the sense of azimuth, since all stars that do not pass between the apparent pole and the zenith present a continuous movement in azimuth, and consequently are not available for this kind of observation. I must also make the remark that, although the elongation of "circumpolar" stars is usually spoken of, the stars selected in this case must be "circumpolar" only in the sense of lying at their upper culmination between the pole and the zenith, and not in the ordinary sense of lying above the horizon at their lower transit; it follows, then, that the possibilities of this method are greater for low than for high latitudes. In fact, as we go farther from the equator, the number of stars available for observation become less and less, at the same time the conditions for observing each individual star at elongation become less and less favourable on account of the higher altitude at which the phenomenon takes place, and the consequent greater liability to errors in azimuth.

Apart from this, the practice of the method is very similar to that which has

been described for latitude, only that the extreme readings are made on the horizontal circle, instead of on the vertical circle.

The filling in of the printed forms with prediction data is rather more complicated than in the case of latitude, this being due to the fact that the stars are observed outside of the meridian, and consequently settings in azimuth as well as in altitude are required. On the other hand, there is not the same necessity for the stars to be grouped in pairs, and even when this is done for the sake of symmetry, there is no restriction as to the difference of azimuth for the two stars of each pair, as there is no refraction to be eliminated.

The selection of the stars to be observed is better made, as in the case of the latitude, on the star map, where the position of the meridian and 6-hour circle after sunset may be easily ascertained, and, considered in connection with the trajectory of the zenith, allow the convenient stars to be found, at small distances over the 6-hour circle, increasing with the latitude.

The elements to be determined in order to point the telescope at the right moment at the proper star are—the time, the azimuth, and the altitude. Each of these elements is easily found by a simple formula, but in case of a whole list it is more expedient to make use of graphic tables such as we have had prepared in our case. On these diagrams may be measured directly the hour angle, at the moment of elongation, the difference of altitude between the star at the same moment and the south pole, and the difference between the elongation azimuth of the star and its polar distance. The variations of the three elements are always relatively small, and may be easily figured on a scale large enough for ascertaining whole minutes of time and circle, and no more than this is wanted for prediction purposes.

As to the observation, it must be borne in mind that its ultimate purpose is always to find out the true direction of a given line on the ground. In consequence, the utmost care must always be displayed in marking out that line in the day time, the theodolite being well centered over a stake, and another stake being driven in at a distance long enough (over 300 feet) for the sidereal focus of the telescope not to be disturbed in sighting it at night-time.

In our case the true bearings have always been based on a minimum of four observations, two being made on eastern elongations in each position of the vertical circle, and two on western in the same conditions; this being done to eliminate systematic and instrumental errors as in the case of the latitude. Still, the same accuracy of results cannot be expected, as small errors in the setting of the vertical axis of the instrument will affect the azimuths much more than the altitudes; the more so the nearer the zenith the observation is made, so that individual errors of one minute or even more may occasionally occur. Still, the accuracy obtained by two pairs of elongations is more than enough for the purposes of our survey.

The calculations for obtaining the true bearings of the sides of our polygonal perimeter have been carried out on two series of printed forms—the first to obtain the bearing of the reference line between the instrument and the stake erected for that purpose; the second to obtain the true azimuth of the sides, as derived from the first and from the successive station angles. As many polygonal stations occur between two successive astronomical stations, a difference must be expected to be found between the azimuths of the first side of a section of the perimeter, as derived from astronomical observation and from the transported azimuths of the preceding sections. This difference is due to two separate causes—the convergence of meridians, and the actual errors of observation at the successive angles. The value of the convergence of meridians for each side is computed by the simple known formula, the required difference of longitude being sufficiently appreciated on a rough sketch

drawn with the magnetic bearings. The remaining difference is treated as a sum of accidental errors, and divided equally among the intermediate angles.

As the magnetic bearing of each side is recorded, and the true bearing is now worked out, the difference between the two is taken, and duly registered as one of the more important parts of our work, for the purposes already mentioned.

To give an idea of the accuracy that may be expected in this kind of work, I may state that in a polygonal network of about 160 sides, with an average of one astronomical azimuth for each 10 sides, the average error of azimuth between two successive astronomical stations, apart from the convergence of meridians, was $1' 30''$, the maximum individual error amounting to $3' 20''$.

Time.—Observations for finding the mean time at each astronomical station are usually made on the first day of stay. These observations are made by single or corresponding altitudes of the sun or stars, as the case may be, simply in view of finding the error and rate of timekeepers, and do not require more accuracy than is necessary for the prediction of culminations and elongations.

On this subject I will make only two remarks. The first refers to the time-pieces themselves. We have had some experience in the so-called pocket chronometers, English and Swiss make, and have arrived at the conviction that, for field service, they are of no more value than a good common watch, twenty times less expensive. It has happened that while the chronometers and watches have been together under observation at the Santiago Observatory, the rate of the former was usually more regular than that of the latter, but in travel and field practice, the results were usually reversed, so that large silver watches, such as the American Waltham lever, have been found more reliable for our purposes.

My second remark refers to the usual method of finding the true time and rate of watch, that is, by equal altitudes of the sun, commonly observed in our case with the sextant mounted on a stand, and mercurial horizon. As it is known, the middle position of the sun requires a correction, called "equation of equal altitudes," to be reduced to the meridian; this equation being composed of two terms, one of which varies with the sun's declination, and the other with this and the latitude, so that both change signs twice a year. As the value of the equation is always small, it is not easy to detect when an error of sign has been introduced by mistake. When this method is to be extensively employed, however, as in our case, it is easy to provide at the same time for a check as to the signs and value of both terms of the equation. This we have done by means of two diagrams on which the said signs and values may be read at once for every day of the year. It must be observed that to give rigorous results both diagrams should only be employed for one year, and the second only for a given latitude; still the errors due to the first cause do not amount to more than one or two tenths of a second, and a scale for measuring the second correction at different latitudes is easily appended to the second diagram. Hundredths of seconds are easily read on copies of those diagrams.

For longitude work, however, the mean time of the place must be known with the utmost accuracy at the time of observation, and the rate of watches must be eliminated as far as possible—that is, the observations for time and for longitude ought to be done as simultaneously as circumstances should allow. This is usually obtained by single observations of stars for time before and after the observation for longitude, so that the same watch may be used; and even equal altitudes of one star, culminating at the time of the observation for longitude, have been observed. There is, however, another method capable of employment with a transit that we have recently brought into use, and I think it is calculated to give as good results for time determination as those which have been described for latitude

and azimuth, because it is founded on the same principles. By this method, the time is deduced from observations made on a pair of stars of nearly the same declination, a little before and after the moment of their equal altitude at opposite sides of the meridian.

To thoroughly understand the practice and advantages of this method, a few explanations are, perhaps, convenient. Supposing there were two stars of exactly the same declination, and the precise moment of their equal altitude be registered according to a certain watch, it is quite clear that, as the sidereal time of the moment of equal altitude would be given by the average of the right ascensions of the supposed stars, the watch error might be found at once. Now, if it is true that pairs of stars of exactly the same declination are not available, we may have them with small differences of declination, and corrections may be introduced, similar to the equation of equal altitudes for the sun. In the same way, as observations cannot, of course, be made simultaneously with the same telescope on the two stars at the mathematical moment in which they both arrive at the same altitude, a little lower (or higher) altitude may be observed, in which case the eastern star reaches it some minutes before and the western star the same number of minutes after that mathematical moment (or the reverse). Proper corrections are, of course, introduced, by means of tables and the right time obtained with little calculation.

The method I have just outlined is described in some astronomical treatises, but I believe it is not so extensively employed as it ought because the elements for the corrections require to be specially tabulated for the latitudes at which the observations are to be made. It is only in cases involving a large number of observations that the time and labour expended in such preparations will be amply repaid by the saving, especially of time, in making the observations by this method.

For the special case of Chile, tables have been prepared including 145 fundamental stars above the 5th magnitude, grouped in 200 pairs, the difference in declination for the two stars of each pair not exceeding two degrees, while the average interval between the moments of equal altitude for two successive pairs is a little more than seven minutes.

The observation may be made with the sextant or an ordinary transit, but more accurately and easily with the zenith sector already described, especially if additional horizontal wires have been inserted so that the interval between the extreme wires is a whole number of seconds. With such an instrument the method practised is as follows:—

A number of pairs are selected out of the list so that they do not overlap each other. For instance, if the eastern star is to be observed three minutes before the moment of equal altitude and the western one three minutes after, then seven or eight minutes must elapse between the moments of equal altitude of any two consecutive pairs of the observation list.

The settings for the horizontal and vertical limbs as well as the watch times are now computed to whole minutes with the aid of the special tables, and put down on the prediction form. The zenith sector used by us was fitted with five horizontal wires, the interval between the extreme ones being 1000" of arc. The instrument is carefully set in altitude for each pair and re-levelled for each star, care being taken not to disturb the tangent screw of the sector during the observation of each pair. The times of bisection of the stars by each wire are registered, and also readings of the sensitive level are made before and after each observation; the divisions of the level being equal to 5" of arc, their corrective value in fractions of seconds of time for each pair is easily ascertained and made use of. The half-sums of corrected averages of all the observed bisections for each star constitute the final record. As all the stars of the list belong to the English or to the French

ephemerides, the exact right ascension and declinations are taken therefrom for the date of observation, and with the aid of the ephemeris and of the special tables short final calculations are worked out, from which the error of the watch for each observed pair of stars is obtained.

In a test of this method made at the Santiago observatory on November 28, 1897, five pairs of stars were observed in an hour of time; the extreme difference between the five results being one-quarter of a second, and the probable error less than one-tenth of a second.

Longitude.—Between the 23rd and the 41st parallels there are some twenty places, more or less near the foot of the Cordilleras, where longitude has been or will be determined by means of the electric telegraph; these places being the starting-points for the partial polygonal surveys.

Telegraphic longitude work is described in astronomical treatises, and I shall accordingly confine myself to some remarks suggested by our experience on this point.

The time available for the operation is usually between 9 and 11 at night, when all intermediate offices being previously notified, the line is left clear, and direct communication is established between the place of observation and the Astronomical Observatory at Santiago, where the time-signals are chronographically registered. A separate register is also kept, of course, at the place of observation, where a good watch is used as timekeeper. On this subject I may observe that, as the watches do not beat even parts of a second, it has been found convenient to have at hand an old marine chronometer, only to be used for the beat; this timepiece is transported unwound and with a stop inserted across the lever-wheel. In camp it is kept running some hours before the transmission begins, and is used for this operation only, so that the manipulator key may strike half-seconds as the Observatory signals, and only the watch times are registered, at the first and last stroke of each series of ten seconds. When no interruption occurs, the whole operation, including several exchanges of series, is satisfactorily completed in an hour.

As the time for the transmission of the signals is always known beforehand, the last-described method of time determinations is especially suited for longitude work, because the pairs of stars may always be selected so as to eliminate the effect of the watch rate. If the same observer is to do the astronomical as well as the telegraphic work, four pairs of stars may be observed, two before and two after, the transmission of signals; with two observers, five pairs may be observed while the transmissions are going on. In the latter case it may be considered that, for all practical purposes, the rate of the watch has no influence at all over the accuracy of the longitude obtained. Indeed, in those conditions, it may be said that all causes of error but the differences of personal equation between both operators have been eliminated. It must not be forgotten, however, that, like latitude, the local time on which longitude work is based, is liable to be affected by the local deviations of the plumb-line.

It would require, of course, an accurate triangulation between two points, to find out exactly the actual errors that had been incurred when finding the difference of longitude between the same by the exchange of telegraphic signals. Still, a check on the practical value of the combined survey, by polygonal traverse and astronomical positions, has been obtained this last season, when at the meeting-point of two branches of the perimeter, the origins of which are more than 700 kilometres apart, the error in longitude was found to be 19'' of arc, about 400 metres, a result quite satisfactory for the purposes of the survey, the larger scale of which is 1 : 100,000.

Nearly 12,000 miles of polygonal network have been measured in the Andine

valley, within the last six years, by the Chilean Boundary Commissions, in the manner just explained. We hope, in the course of the present year, to complete the connection between the last polygonal sections in the southern portions of the country that is to be covered by the survey; a sure base will thus be laid for all future partial surveys to fall in at any point of our polygonal perimeter; the geographical positions of all such points being intended to be then published for that purpose.

The following discussion took place:—

SIR JOHN FARQUHARSON: I am afraid I am not well qualified to make any remarks, because the whole of my experience has been with trigonometrical surveys. The paper is certainly a very interesting one, and I am sure, when it comes to be published in the *Journal of the Society*, it will be exceedingly useful to read up. What I generally had to do in the way of surveying was to measure from very carefully triangulated areas down to feet and inches, but when you come to a map of 1: 800,000 this is a different matter altogether. The only question I should like to ask, being as I am more accustomed to triangulation, is whether the whole of these surveys are done by this polygonal system, or whether they are connected with or start from any triangulated survey. If they are, I should like to know what the errors of closure are, where the surveys meet. I must say that Prof. Bertrand has given a most interesting paper, and the whole Society is much obliged to him for it.

SIR MARTIN CONWAY: I don't know that there is much I can say. I have had, of course, very limited experience of the kind of survey that a government carries through, because in my own travels my work has been done entirely by myself, without assistance from anybody, and carried on in connection with a whole lot of other work, but I carried on my survey on the system explained to-day, that is, Colonel Tanner's system, and found it admirable so far as my possibility of accuracy went. My work fitted on to the triangulation carried on previously by Mr. Minchin, and our results absolutely tallied. There is no doubt whatever that in rough mountainous country, unless a great deal of time can be given to it, it is almost impossible without very great expenditure, especially in this Patagonian region, with its great forests, to carry out careful triangulation, and the system of the Chilean Government is, I think, a very good one. There are many questions, in matters of detail, which I think I must postpone asking until I get an opportunity of speaking to Dr. Bertrand personally. He has certainly put his subject before us in a very interesting manner.

Prof. BERTRAND: With regard to Sir John Farquharson's question, as to whether there was any connection between our polygonal survey and a triangulation, I must say there was a trigonometrical survey many years ago in Chile, but this, I am sorry to say, has been found very defective. Of late years the staff of the army has begun a triangulation in the province of Santiago, but up to now we have only gone on a limited scale. So far as we have had this survey as a check on our polygonal survey, they have tallied well; but, as I have said, we have not done very much—not really enough to use as a precedent. The only check we have had on our work has been the telegraphic one which I have mentioned. I should say that triangulation may find this work not absolutely accurate, but accuracy here must be considered in connection with the purpose of the work. A difference of 100 metres in the breadth of a country is not a consideration when only roads and such things are the objects of the survey, and then it should be borne in mind that it was a question of making the survey in a very small way or not at all; because, if the

triangulation had been attempted, it must have been very perfect, and it could not have been carried through in such a way. You must please excuse me, but I have not sufficient command of your language to speak at length in such a way as I should like.

The PRESIDENT: I cannot doubt but that eventually there will be a rigorous system of triangulation throughout Chile, but it will be a work of extreme difficulty, and cannot be expected to be executed for some years to come. In the mean while this polygonal system has been thought out and adopted, and I think the meeting will wish to congratulate Prof. Bertrand and his colleagues for the admirable way in which it appears to have been executed—for the way in which every point connected with it, both as regards computation and adaptation of instruments, has been carefully thought out. He has given us a very interesting account of this system of survey, and I am sure the meeting will wish me to express to him our thanks for what he has told us. I therefore propose a vote of thanks to Prof. Bertrand.

THE MONTHLY RECORD.

ASIA.

Mr. Skeat's Expedition in the Malay Peninsula.—Some of the least-known portions of the Malay peninsula have lately been explored by an expedition under Mr. W. W. Skeat, which included several scientists from Cambridge University. From Sengora, on the east coast of the peninsula, the whole of the districts forming the extreme south-east of Siam were visited, after which attention was turned to the portion of the west coast opposite Pulo Penang. Mr. Skeat ascended the almost unknown Lebir (Libi) river, and visited Mount Gunong Tahan, probably the highest mountain in the peninsula. Valuable results in the provinces of zoology, botany, and ethnology were obtained. Mr. Skeat's full report will be awaited with much interest.

Dr. Sven Hedin in the Lob Nor Region.—Writing from Yangi-kul on May 14 last, Dr. Sven Hedin gives some details respecting his recent work in the region of Lob Nor, with the results of which, he says, he has every reason to be satisfied. He had just returned from a two months' journey, during which he had followed the old river-bed of the Kum-darya, first discovered by Kozlof, until, to his great satisfaction, he found it enter an old lake, now dry, which in his opinion cannot but be the ancient Lob Nor. On the shore he found the ruins of a town with artistic sculpture in wood, as well as an old road. One day's march north of Kara-koshun he came upon a new lake of large size, formed by a new eastward-flowing arm of the Tarim. The result is, he says, to fully confirm the theories put forward by him in his book 'Through Asia.' Dr. Hedin has made very complete surveys along his route, and has fixed the positions of forty points astronomically. After resting during the summer in Northern Tibet, he hopes to revisit the Lob region, and in January, 1901, to cross Tibet to the sources of the Indus, finally returning through India.

Railway Surveys in China.—Although all projects for the opening up of China by means of railways, etc., under European superintendence are for the time being in abeyance, there can be little doubt that the recent movement in that direction is only temporarily arrested by the present state of disorder. Whether or no the schemes already set on foot will be eventually carried out in their original form, the work done in the way of preliminary reconnaissance is bound to prove of value in one way or another. The report made to the Peking Syndicate on the

results of surveys carried out on behalf of that body by Mr. J. G. H. Glass contains matter of much interest with respect both to the commercial and physical geography of North Central China, particularly the former. The work was carried out by a large and competent staff of engineers, both military and civil, and the results may be relied on as thoroughly trustworthy. The concessions accorded to the Peking Syndicate were concerned with the mining districts of Honan and Shansi, and the opening up of communications between the same and the navigable waters and trunk railways of the empire. The coalfields to which especial attention was directed were those of Tse-chau on the southern borders of Shansi, and Siu-wu in Northern Honan. To reach these, it was at first proposed to utilize the navigation of the Han river as far as Fan-cheng, and thence construct a line of railway north to Honan, with a continuation across the Hwang-ho to the districts in question. A shorter line east from the latter to the head of navigation on the Wei river was also contemplated, as well as a westward extension through Tung-kwang, the "Gate of Central Asia," to Si-an-fu. Mr. Glass's party was broken up into sections, and more or less detailed surveys were executed along all these lines. Mr. Glass himself visited the coal-mines, and found that previous reports as to the amount and quality of the deposits were fully confirmed, excellent coal being produced at a cost, at the pit's mouth, of from 1.55 to 2.3 shillings per ton. Given adequate transport facilities, for want of which this great mineral wealth is at present all but neglected, Mr. Glass thinks that the coal of Shansi and Honan should find an enormous market, not only in the densely populated plains of China, but at Shanghai, Hong Kong, and even at San Francisco. The examination of the Han river proved that the obstacles to navigation are greater than had been anticipated, and Mr. Glass strongly urges the adoption for the railway of a route south-east to Pu-kau, on the Yang-tse, opposite Nanking, which would allow of the direct loading of the coal into ocean steamers. A rapid survey of this route was made, and showed that no exceptional difficulties would be encountered. Of all the contemplated lines that to Tse-chau, in Shansi, involves the greatest engineering difficulties, the present road descending from the plateau to the plains by gradients sometimes as steep as 1 in 4. A fairly satisfactory route was however found, and Mr. Glass considers that, in view of the possible development of the iron industry of Shansi, this line must eventually be constructed. One of the most important engineering works will be the bridging of the Hwang-ho, for which a very satisfactory site has been obtained. The cost has been estimated at £250,000. It is remarkable that throughout the operations of the surveyors most cordial relations were maintained with the inhabitants, who seem to have manifested no anti-foreign feeling, but who are more than once described as anxious for the railway. Detailed reports on the country traversed by the various officers in charge of the parties are given as appendices.

Japanese Trade in 1899.—A recent consular report on the trade of Japan during 1899 shows that, with the exception of 1898, the year under review showed a larger volume of foreign commerce than any year since the first opening of the country to foreign trade. The year was in some respects a critical one, owing to the fact that the new customs tariff took effect from January 1. In anticipation of the new duties on imports, these had reached abnormally high figures during the latter part of 1898, with a result that a great falling off took place during the first half of 1899. A marked recovery, however, set in during the last six months of the year, with the result that the total trade fell only slightly behind that of 1899, while the exports showed an increase of just over £5,000,000. Raw cotton is the most important item in the import list, and its amount continues to increase rapidly, owing to the steady development of the cotton-spinning industry, which actually

now yields a surplus of yara and tissues for export. This fact, together with the recent revival in the raw silk trade, and an exceptional rice harvest, are the chief causes in the satisfactory returns of exports. The manufacture of woollen goods has also made great strides during the past few years. The import of iron and steel manufactures showed a marked falling off, but pig-iron, obtained chiefly from Great Britain, maintained its position. Chinese iron seems, however, likely to be a serious rival both to English and American pig-iron in the future. Manufacturing Japan is said to be driving agricultural Japan into the background, and the importation of food-stuffs other than rice becomes greater year by year. Of the old open ports Hiogo and Osaka taken together increased the lead over Yokohama, which had been gained in 1898, as regards the total value of trade. Of the twenty-two new ports opened to foreign trade on August 4, 1899, Shimonoseki and Moji—practically one port, as they are separated only by a strait $1\frac{1}{2}$ mile wide—are of most importance at present. Japanese shipping shows a great and continued development, while German and Russian enterprise is very marked, contrasting strongly with the apathy shown by British shipowners. The British share in the total shipping was 40 per cent., but showed a slight falling off as compared with 1898.

Dr. J. Jankó's Ethnographic Researches in Siberia.—Dr. Johann Jankó, superintendent of the Ethnographical Section of the Hungarian Museum at Budapest, carried out in 1898, on behalf of Count Eugen Zichy, a thorough investigation of the ethnographic relations of the Ostiaks, from the point of view of their



DR. JANKÓ'S ROUTES BETWEEN THE OB AND THE IRTISH.

racial and linguistic affinities with the Hungarians. The following notes are taken from a paper lately read before the Hungarian Geographical Society, in which Dr. Jankó gave some account of the results of his researches. The region visited was the tract of boundless forest between the Irtysh and Ob, into which the traveller

pushed his way from three sides, advancing 93 miles up the Demyanka valley, 180 miles up that of the Salym, and 370 miles up that of the Great Yugan. The total distance travelled during the space of two and a half months was over 1800 miles, all by canoe, the only means of locomotion in this region. The inhabitants of this vast primeval forest are Ostiaks, and had never previously been visited by a European. Dr. Jankó found abundant opportunity for the observation of valuable ethnographical and anthropological facts. He made a collection of some 300 objects, took a similar number of photographs, and about 5000 anthropological measurements and drawings relating to 125 individuals. He procured likewise thirty skulls and two complete skeletons of the forest Ostiaks. The return journey to Europe was made *viâ* Tomsk. The working up of this material has already been almost completed, and will shortly appear among the collected results of Count Zichy's journeys, of the ethnographical section of which it will form the second volume, under the title 'Anthropologische Studien über die Ostjaken.' The first volume, also from the pen of Dr. Jankó, has already appeared under the title 'Herkunft der Magjarischen Fischerei.'

AFRICA.

The Hostains-D'Ollone Expedition.—The fourth number of *La Géographie* contains some additional details respecting the expedition under MM. Hostains and D'Ollone from the Ivory Coast to the Sudan, to which reference was made in our May number. Entering the basin of the Du, as the Kavalli is known to the natives (the latter name being in use by Europeans only), the expedition reached, in $5^{\circ} 45'$, the confluence of its two main branches—the Duo from the east, and the Duobe from the west, of so nearly equal size that neither could at once be laid down as the main stream. The determination of this question being of some importance, owing to the assignment to France of the course of the river in the agreement with Liberia, it was decided to first explore the western branch. After a stay in the country of the Graorcs between the Duobe and the Duo, the former river was crossed, and a route taken for the district of the Palubes who occupy the basin of the Bhue, a tributary of the Duo. This led through an uninhabited tract two days' journey in width, and subsequently across a mountainous district separating the Kavalli basin from that of the Non, a stream not marked on the maps. At the large village of Paolo in the Sapo country it was found that the Duobe and Duo, which were thought to have been left to the east, flowed north of the then position, coming from the west. Proceeding through an uninhabited forest, the expedition therefore again crossed the two rivers, the Duobe being only some 20 yards wide at a distance of about 40 miles from its source. The Kavalli (Duo) here makes a great bend to the west, enclosing the territory of the Bos and Boniaos. It was once more crossed at a point where its width was 100 yards and its depth some 30 feet, its waters being much swelled by heavy rains. Beyond 7° N., the forest still continuing, the expedition entered a region the tribes of which differed entirely, both in language and customs, from those previously met with, all of whom had seemed to belong to the same stock. The new tribes, known generally as the Gons, practised weaving and were clothed, while further south the people went nearly naked. They are, however, all cannibals. Being treacherously attacked, the expedition fought its way north for six days, and passing east of the Nimba mountains (6000 to 7000 feet) reached Nzo, the furthest point in this direction which had been gained from the north. Beyond this the forest became thinner, finally ceasing at Mananko. Besides exploring the whole Kavalli system, the expedition determined the water-parting between that river and the more western streams, fixing the position of the sources of the Sino, Dubhe, and San Pedro.

The French in the Lake Chad Region.—The news received early in August from Lake Chad shows that the career of conquest of the adventurer Rabah has at last been closed by his defeat and death in battle with the French forces united under the command of M. Gentil. These included, in addition to the latter's own expedition, which made its way north from the Congo, the forces brought from Algeria by MM. Foureau and Lamy, and from the Niger by Lieut. Joalland, on whom the leadership of the expedition, originally despatched under Voulet and Chanoine, finally devolved. Both these parties had made their way round the east shores of Lake Chad, and joined M. Gentil on the lower Shari. After pacifying the country around Zinder, Lieut. Joalland set out for Lake Chad, which was reached on October 23, 1899. French influence was established in Kanem, after which the expedition proceeded south, reaching Gulfei, on the Shari, December 11. The same place was reached in March last by the Foureau-Lamy expedition, which had left Zinder in December in two columns, afterwards taking the same route through Kanem as Lieut. Joalland. The decisive battle was fought a few miles north-west of Kussuri, at the mouth of the Logone. Although victorious, the French have had to mourn the loss of Major Lamy and of Captain Cointet, both of whom fell in the action. M. Foureau is said to have reached Brazzaville, *en route* for France, on July 11, being thus the first European to connect the Mediterranean with the Congo by his itinerary. A journey through the unexplored districts between the Shari and the Sangha is said to have been undertaken in May last by MM. Huot and Bernard.

Currents of the Congo Mouth.—A report by Commander H. E. Purey-Cust, issued by the Hydrographical Department of the Admiralty, gives the results of observations made in 1899 by H.M.S. *Rambler*, with a view to throwing light on the conditions of the under waters at the inner end of the Congo cañon. In addition to the determination of the density and temperature of the water at various depths, the operations included the measurement of the rate of the undercurrents and a comparison with that at the surface. The results are summarized thus: "The observations appear to show that the fresh water of the Congo extends from the surface to the bottom until reaching the head of the Congo cañon just below Kissanga, when it encounters a body of salt water filling this deep gully. It then runs over this denser water with decreased depth and increased velocity, the layer of fresh water being deeper with the ebb tide and shallower with the flood, both decreasing the broader the river becomes, until, from being from 3 to 5 fathoms deep just below Bull island, it is only a few feet deep after passing Bulabemba point. This deep body of salt water is either perfectly still, or has a very slight tidal flow (0.2 to 0.5 knots per hour) up-river with the flood, and down with the ebb tide." The method found most successful for the determination of the undercurrents was one in which a conical canvas drag, made fast to a 14-lb. lead, was attached to the wire of the steam-cutter's sounding-machine, the wire being kept vertical by adjusting the speed of the engines and careful steering. Determinations of the nature of the bottom were also made.

Expedition to the Source of the Zambezi.—News has been received respecting a visit to the source of the Zambezi, made early this year by Major Colin Harding, commanding an expedition to Barotseland for the purpose of recruiting a force of native police. From the Victoria falls the Zambezi was ascended in boats, which were finally abandoned at a series of small but picturesque cataracts in 11° 38' 55" S. The loss of two boats with stores involved a scarcity of food, and the carriers refused to advance; Major Harding, however, pushed on with a few trusty followers, and reached the source of the river on March 17, at a spot where seven springs shadowed by splendid trees burst forth at an elevation of 4950 feet.

The position is given as in $11^{\circ} 33' 45''$ S., $24^{\circ} 51'$ E. Major Harding has since proceeded westward to explore the country between the Zambezi and the West Coast, where his work may be expected to supplement that of Major Gibbons's expedition. The Zambezi sources were, it will be remembered, visited last year by Major Gibbons on his journey to the upper Congo.

The Province of Gaza, Portuguese East Africa.*—A useful sketch of the Portuguese province of Gaza, occupying the country watered by the lower Limpopo and its left-bank tributary the Chengane, was last year given to the public by Captain Gomes da Costa, as the result of personal observations during military service in the colony. The author describes concisely the physical geography, native population, climate, trade and resources, communications, administration, etc., of the country, as well as the principal historical events, especially the Zulu invasion, of which it has been the theatre during the present century. He divides the territory into two distinct types of surface, distinguished by the native names "bilene" and "mananga." The former is the plain-country (occurring in the river valleys), with rich covering of humus, well provided with water, and admirably suited for agriculture; the latter, sandy waterless tracts, at a higher elevation and covered with thorny scrub. The geological formations are as a rule sedimentary. Besides the "bilene," which owes its fertility to its annual inundation by the rivers, the only fertile district is that of the Mchopes (a section of the Tonga race which gives its name to the administrative division on the coast east of the Limpopo mouth). In the coast region the rains begin in November, the greatest fall occurring in the following three months, while March and April are showery. June, July, and August are the driest and coldest months. In the interior very little rain falls. The mountainous districts bordering on the Transvaal and the coast zone between the Limpopo and the Zivalla are the most healthy parts of the province. Commerce has received an impetus from the influx of Hindu and other traders since the capture of Gungunyana, but it is one of importation only. The writer thinks, however, that the country possesses great resources, which might give rise to a large and paying export trade.

The Basin of the Komati, South-East Africa.—M. A. Grandjean, secretary of the "Mission Romande," who, during his missionary labours at Antioka, between the Limpopo and Delagoa bay, had many opportunities of becoming acquainted with the geography of the surrounding region, contributes to the *Bulletin de la Société Neuchâteloise de Géographie* for the present year a clear sketch (with map) of the system of the Komati, the river which enters Delagoa bay from the north. This river, which drains the northern part of the Drakensberg range, is of greater importance than might be gathered from its appearance on the map, being comparable both in size and length to the Rhone or Loire. Its course is marked by great bends, which add greatly to its length, its entry into Delagoa bay being from the north and north-east, instead of, as might have been expected, from the west. M. Grandjean describes fully the hydrographical system of the river in the part with which he is acquainted, i.e. the plains which intervene between the mountains and the sea. The country south of the river, within its last great bend, presents some unusual characteristics, its core being formed of a series of sandy ridges separated by swampy depressions without outlet. The tributaries of the river are connected with a series of lakes and backwaters, which in flood receive water from the main stream, and are finally merged in a general inundation. To the north this region of swamps supplies a connection with the basin of the Limpopo. M. Grandjean was able to trace the course of a depression,

* Cap. Gomes da Costa. Gaza, 1897-98. Lisbon: Gomes, 1898.

which at the time of his visit—the height of the dry season—did not contain water throughout, but showed a well-marked bed, by which, according to native report, water-communication is possible during two months in the year. The writer suggests that, if improved, this channel might facilitate the transport of grain from the rich Limpopo valley to the mining centres of the Transvaal, the Komati being navigable to the point where it approaches most nearly the Lourenço Marques railway. The map accompanying the paper is of some original value.

The "Daily Telegraph" Expedition from the Cape to Cairo.—Mr. Lionel Dècle, leader of the *Daily Telegraph* expedition, which is making its way northwards through the whole length of Africa, writes from Fort Jameson, North-Eastern Rhodesia, giving some details respecting the progress of the expedition down to February last. The point mentioned had been reached *via* Salisbury, Tete, and Lake Nyasa, no new ground having of course been broken, the object of the expedition being to study the present condition and the resources of those parts of the continent which already await development. Mr. Dècle has, however, taken a number of hypsometrical observations with aneroid, to determine the relative altitude of the various districts traversed: Daily meteorological observations have also been taken with the aid of Mr. G. F. Powell. The rainy season which occurred early in the present year was unusually severe, rains having commenced early and been likewise extremely heavy. Travelling was entirely interrupted in January on this account. Tete, on the Zambezi, was found to be extremely unhealthy, all the white men and most of the natives of the party being laid up with fever. Mr. Chapman, the second in command, was obliged by ill health to resign his post on reaching Blantyre.

Beira and District.—Mr. McMaster's 'Report on the Trade of Beira for 1899' (Foreign Office, Annual No. 2427, 1900) contains several matters worthy of note. The extension of the Mashonaland railway line from Umtali to Salisbury has been completed, and the work of widening the narrow gauge of the Beira railway to Umtali, which was commenced in May, has been finished to within 100 miles of Beira. The new iron bridge spanning the Pungwe river at Fontesvilla has also been completed. The distance from Beira to Umtali, formerly 222½ miles, will be reduced to 205 miles. Owing to delays occasioned by the war in South Africa, the line from Salisbury to Gwelo and Buluwayo, distances respectively of 150 and 300 miles, will probably not be open for traffic before March, 1901. Work has not yet commenced in connection with the projected Beira-Sena railway; it is pointed out that this line, once completed, would tap a very fertile area of Zambeza, and would attract further trade to this port. A census of the resident population of Beira was taken on December 31, 1899, and, compared with the return for the previous year, shows that the European population of 1467 has increased by 295. Considerable progress has been made with the Chiveve reclamation and embankment scheme, which will shortly be completed. The filling up of this creek, formerly a bed of malaria-breeding mud, has tended to the improvement of the health of the inhabitants of Beira. Indiarubber and coconut planting has been taken up in the district, and, it is thought, should become a profitable industry in the future. A large concession of land has been given in the Sabi valley, where it is intended to cultivate the *Landolphia* vine, which yields rubber freely; it is also proposed to cultivate the *Hevea Brasiliensis*, from which the true "Para" rubber is extracted. The *Kickxia* variety is also being tried on the Zambezi and Buzi rivers. Other industries of recent date in this district are the manufacture of dynamite and other explosives for mining purposes, and of bricks and tiles of all forms.

Mount Kilimanjaro.*—Dr. Hans Meyer's latest work forms a fitting crown to his persevering labours for the elucidation of the geography of the great East African mountain. It makes a sumptuous volume, richly illustrated from the author's photographs and from the sketches of his companion, the artist Ernst Platz, presenting altogether a complete and fascinating picture of the many aspects of nature represented between the forests of the lower slopes and the icy masses which crown the summit. The text describes the author's fourth and latest expedition to Kilimanjaro, and is remarkable for the amount of information which it conveys regarding all branches of natural science, while at the same time losing nothing of its general interest. Geology, plant and animal life, and climatic phenomena are alike dealt with in a clear and instructive manner, and the book must long remain an invaluable mine of information on these subjects. The investigation of the glacial phenomena of the mountain formed one of the main objects of Dr. Meyer's journey, and it is with respect to these, perhaps, that the book presents the most that is new. A separate chapter summarizes the facts so far available regarding the present and past glaciation of East Equatorial Africa, while another treats of the volcanic phenomena and structure of the mountain. Dr. Meyer's surveys added much to our knowledge of its topography, and these results are embodied in an excellent large-scale map. An extensive series of barometrical observations for altitude also gives results of much value.

The German Pendulum Expedition in East Africa.—The expedition under Lieut. Glauning and Dr. Kohlschütter, for the determination of the force of gravity in the neighbourhood of the various East African rift-valleys (*Journal*, vol. xv. p. 178), returned to the coast early in the present summer after successfully accomplishing its task. An outline of the work accomplished is given in Nos. 1 and 2 of the *Mitteilungen aus den Deutschen Schutzgebieten* for the current year. According to the programme which had been sketched out, pendulum observations were to be made in the case of each rift-valley at a series of stations as far as possible on a straight line, some being on the level of the bounding plateaux, and others in the valleys themselves, in order that the relative intensity of the force of gravity might be determined. This rule was generally adhered to, though the conditions of the country, in many parts uninhabited and without the means of subsistence, occasionally prevented the establishment of the stations at quite the most favourable spots. After finishing the work in the neighbourhood of Rukwa, the expedition crossed the Fija plateau to Tanganyika, where observations were made at stations on either side of the lake. That on the eastern plateau was chosen about midway between the Rukwa and Tanganyika escarpments, while the eastern lake station was at the German post of Kasanga. The western lake station was on Cape Bungwe, close to the Belgian post at Moliro, near the frontier of British Central Africa, and the plateau station at Kakoma, about 5 miles from the escarpment. During the dhow voyage to Ujiji, some of the instruments, though fortunately not the pendulum apparatus, suffered somewhat from the penetration of water into their cases during a shipwreck. At Ujiji, in addition to the usual observations, the longitude was determined astronomically, though here, as universally through the journey, operations were much hindered by clouds. The route was continued to Tabora, and thence north-east to Manyara, Nyarasa, and the eastern rift-valley. From Sonyo, north of the Natron lake, the expedition turned south-east to Kilimanjaro and the coast. In addition to the pendulum observations, the magnetic declination was determined at a large number of

* 'Der Kilimanjaro.' Reisen und Studien. Von Prof. Dr. Hans Meyer. Berlin: Reimer. 1900.

stations, and many contributions to the more accurate mapping, as well as to our general knowledge of the regions traversed, made. In the more southern parts Dr. Köhlschütter was able to link his new work to the triangulation of the Anglo-German Boundary Commission, on which he had been the German representative.

Unfortunately, the loss of one of his journals has somewhat marred the completeness of his results. With regard to Rukwa, it is stated that the existing extent of water corresponds to that of the original lake, and that the larger area observed some twelve years ago was the result of inundations.

East African History.*—The recently published work of Herr Strandes is a useful contribution to the history of European dealings with the African continent. Less is perhaps known respecting the period of Portuguese influence on the northern half of the east coast than of any other section of African colonial history, for though dealt with in works—both ancient and modern—which treat of the Portuguese Eastern Empire as a whole, no independent work has been devoted to the fortunes of that people in the particular region in question. The author shows a wide acquaintance both with the original sources of information and with the writings of modern authors with any bearing on his subject. The former include not only the standard historians who treat of the earlier portion of the period, but the scattered data for the decline of Portuguese power, some of which have been published at Lisbon and Goa, while others still remain buried in the repositories of original records. The greater part of the story of course centres at Mombasa, the various fortunes of which are traced down to its ultimate abandonment by the Portuguese in 1729, though other places on the coast, such as Kilwa, Melinde, and Brava, meet with a fair share of attention. The chapters relating the first establishment of the Portuguese on this coast are followed by a concise but instructive sketch of its history under Mohammedan (Arab, Persian, and Indian) influence, in which also some details respecting the ancient Chinese dealings with East Africa are given.† Herr Strandes considers that the stage of culture to which the East African centres had attained before the arrival of the Portuguese has been frequently over-estimated, and points to the fact that in all essentials the native life on the coast is identical with that four hundred years ago as an illustration of the stagnation attending Mohammedan civilization. He also thinks that the Portuguese power—which has left next to no traces behind it—was always exceedingly limited on this part of the coast. It is extremely doubtful whether any accurate knowledge was gained of the interior. A special feature of the book is the series of excellent photographic illustrations of ancient buildings, including some, such as the mosque at Kilwa, anterior to the arrival of the Portuguese. It was the interest aroused by these which led the author, who is personally acquainted with the East African coast-lands, to the inception of his task.

AMERICA.

Shipping and Ship-building on the American Lakes.—An interesting report by Mr. T. Erskine, British vice-consul at Chicago, on the shipping and ship-building of the American lakes, has been issued by the Foreign Office (Miscell. Series, No. 526). Mr. Erskine gives a vivid idea of the commercial activity which prevails on the great lakes, and which is, he says, annually increasing. An event

* 'Die Portugiesenzeit von Deutsch- und Englisch-Ostafrika.' Von Justus Strandes. Berlin: Reimer. 1899.

† The author has the authority of Prof. Brinckmann, of Hamburg, for stating that the China ware often collected by Europeans on the coast at the present day, dates, not from the early period of Chinese intercourse, but from about a century ago.

of much importance for the future of this trade has been the opening of the improved Welland canal, the locks on which will now allow the passage of vessels 270 feet long, 45 feet wide, and drawing 14 feet. British vessels may, it is thought, obtain a share in the lakes' trade, though it is open to question whether such as can pass through the Welland canal will be able to compete with the big American freighters, some of them capable of carrying 7000 tons of grain at each trip, which ply in connection with the railways to New York. Already the Canadians are advocating the construction of a canal from Georgian bay to the Ottawa river, giving a direct waterway to Montreal, and shortening the distance from Chicago and Duluth by about 400 miles. It is hoped that, if constructed, this canal would allow the passage of larger vessels than can pass through the Welland Canal. Of a total of £2,824,282 representing the direct imports to Chicago in 1899, Great Britain is credited with £653,546, nearly all of which must have come through the United States. Grain and other articles destined for Europe go principally to Buffalo, where they are transhipped either to barges to pass through the Erie canal or to the railways. There seems, therefore, an opening for British ships to obtain a share in this trade. The total fleet of the great lakes includes 3435 vessels, apart from Canadian vessels, which, if added, would bring up the gross tonnage to some 6,000,000 tons. Chicago, though at present showing the largest amount of business, is running the risk of losing some of her trade owing to the difficulties of the Chicago river. Manitowoc and Milwaukee are both rising ports. The ship-building yards on the lakes are now doing a large business, and it is thought that the enlargement of the St. Lawrence canals will enable them to compete with Atlantic coast shipbuilders. A yard is being built by the largest firm of the latter at Collingwood, Ontario, a town with the promise of a bright future, probably destined to be a great shipping port for the ore of the Laurentian mountains. The American vessels are built with every possible labour-saving device, and improved machinery capable of unloading ore at the rate of 300 tons per machine per hour, has lately been adopted.

Trade and Industry of South Carolina.—A recent consular report on the trade of Charleston and district for 1899 records a considerable falling off in the export of raw cotton both from Charleston and Savannah, this being accounted for by the unusually high prices which prevailed and the great demand for cotton on the part of southern manufacturers. South Carolina is rapidly taking a prominent position as a cotton-manufacturing state, and it is thought that before many years the bulk of the cotton grown in America may be manufactured in the states where it is produced. At the present rate of increase, the American mills may soon equal the English in their facilities for production, while manufacturers trust to the development of the markets in the Far East to enable them to dispose of their whole output. The phosphate and lumber trades have shown a marked improvement, the output of the Tennessee phosphate mines having in particular largely increased. The report includes particulars respecting the experiments at tea-cultivation lately made at Pinehurst. The area planted now exceeds 50 acres, from which the returns have been good, while the tea produced is of a high grade. The feasibility of the culture, so far as climate is concerned, has been conclusively tested by the severe cold of last winter. In view of the high price of labour, success will depend on high field productiveness, the use of machinery in the factory, and the growth of such qualities of tea as cannot be transported from the East without deterioration.

Geology and Geography of Jamaica.—The recently issued monograph by Mr. R. T. Hill on the geology and physical geography of Jamaica is an important contribution to our knowledge of the island under those aspects.

The work, which forms the thirty-fourth volume of the *Bulletin* of the Museum of Comparative Geology at Harvard College, is based on surveys made by the writer for Prof. A. Agassiz. It supplies an excellent example of the way in which the present features of a region may be elucidated by a knowledge of its geological history, and besides acquires a special importance from the fact that the phenomena observed in Jamaica may be taken as typical of the geological development in the Antillean region as a whole, so that new light is thrown on the wider questions relating to the American continent. In spite of the attention devoted in the past, especially by the official survey, to Jamaican geology, a renewal of research was much needed, for, in the writer's opinion, previous work had failed to solve the essential problems of the succession and age of the strata, the confusion being due to the premature death in 1862 of Mr. Lucas Barrett, who alone was able to correlate the work of his subordinates. Of the several sections of Mr. Hill's work, the first, which gives a clear sketch of the configuration of the surface, is of the most strictly geographical interest. At the outset, the importance of the position of the island in the centre of the American Mediterranean (strikingly shown by the diagram on p. 17) is explained. The outline also, when analyzed, is of great significance, for while the general trend of the island is east and west, nearly half the coastline is diagonal to this cardinal direction, marking a survival from the earlier days of Antillean history. Mr. Hill divides Jamaica into (1) a nucleus of mountain ranges in the interior; (2) an elevated limestone plateau surrounding the mountains and ending abruptly towards the sea; (3) the coastal bluffs of the outer margin of the plateau; (4) the low coastal plains. A very marked peculiarity is the abrupt sea face of the mountainous upland, to which Mr. Hill gives the name of "back coast border." The secondary features are interior valleys and basins in the summit of the plateau, certain coastal benches and terraces carved out of the margin of the back coast border, and the drainage valleys. The mountains and the plateau show two very different types of relief, the former being marked by knife-edged salients and angular re-entrants, while the hills of the latter present uncorrugated, densely wooded slopes. The present features are of complex origin, being due to two periods of mountain-making; two great epochs of subsidence; and a later uniform elevation, which added the modern coastal phenomena. The configuration extends below sea-level, which indicates that once the island was more extensive than at present. The geological and topographic evolution of Jamaica is fully dealt with in the fourth section of the work, and the wider aspects of West Indian history in the sixth, at the close of which the probable course of events connected with the various uplifts is sketched. The last great orogenic movement of the kind was in Oligocene or Miocene time, and by it many of the islands became connected, being severed by submergence into their present outlines in Miocene or Early Pliocene.

Trade, etc., of Jamaica, 1898-99.—The recently issued report (Colonial Report, Annual No. 283) by the Governor of Jamaica gives hopes that the recent period of depression is passing away, and that a fair measure of prosperity may again be enjoyed. Both exports and imports show an improvement in value, the latter under every head except manufactured articles. During the decade ending with the year under review, the greatest proportional increases occurred in the produce of fruit (bananas and oranges), cacao, ginger, and pimento, the last three, however, being all minor products. The export of bananas—now the mainstay of Jamaican agriculture—reached a value, in 1898-99, of £168,000, and that of oranges, £123,000. After a persistent decline for many years, the sugar industry showed some improvement. With two-thirds of the island still uncultivated, this is necessary for its prosperity as well as the fruit industry, and not the substitution

of one for the other. Hopeful signs of an intelligent determination to meet changed conditions, by improvement of methods, etc., are said to be apparent. The proportion of trade carried on with great Britain has much declined of late years, fruit, which now forms over forty per cent. of all exported products, having been sent almost entirely to the United States.

Remeasurement of an Arc of the Meridian in Ecuador.—The projected revision of the measurement, originally carried out on behalf of the French Academy by La Condamine and his associates, of an arc of the meridian on the tableland of Ecuador, has now come a step nearer realization. It will be remembered that an expedition was despatched last year by the French Government (*Journal*, vol. xiv. p. 323) to carry out the preliminary examination of the ground necessary for the proper maturing of the plans. Captains Maurain and Lacombe, to whom this work was entrusted, arrived at Quito in July of last year, and during the next four months went over the whole ground to be covered by the operations, from the frontiers of Peru to those of Colombia. In the north they fixed the positions of ten new geodetic and one astronomical station, and chose the ground for a base-line. In the south two new base-lines were chosen, one of them situated within Peruvian territory, and the positions of fifteen new geodetic stations were fixed. In the course of their labours some thirty of the peaks of the Andes were ascended. Their report has now been presented, and Captain Maurain has also given an account of the work done in the seventh number of *La Géographie*. He estimates that to complete the undertaking the co-operation of five geodeticians for four complete years will be necessary. The advice and co-operation of the French Academy of Sciences, the present representative of the body from which La Condamine and his companions received their commission, has been asked by the French Minister of Public Instruction. A committee has been formed, which has reported on the methods to be adopted in the *Comptes Rendus* of the Academy for July 23 (vol. 131, No. 4). The principal point on which a decision has to be arrived at is that of the number of degrees to be included in the proposed arc. The original proposal was for one of 6° , but a suggestion has been made that by reducing the length to $4\frac{1}{2}^{\circ}$, from the Colombian base to that of Targui, the most difficult and costly part of the work would be avoided. The Academy committee, however, strongly urge the retention of the original plan, pointing out that the value of the measurement of the larger arc would be more than proportional to its length, and that it is desirable that the new results should be comparable with those obtained in mean latitudes by the measurement of arcs of large amplitude.

POLAR REGIONS.

German Arctic Expeditions.—Two German expeditions, each more or less concerned with the search for traces of Andrée, are proceeding this summer to the Arctic. The one under Captain Bade, of Wismar, in Mecklenburg, has for its objective East Spitsbergen, Kong Karls Land, and Franz Josef Land, all of which the leader proposes to carefully examine. He also hopes to learn some tidings of the expedition of the Duke of the Abruzzi. The other expedition was to start from Hamburg, under Captain Bauendahl, about the middle of August. Its programme is somewhat more ambitious, the pole itself, or any still undiscovered land that may lie before it, being the ultimate goal aimed at. With a sailing vessel of only 44 tons register, the leader hopes to push into the pack north of Spitsbergen, but in case of progress being entirely stopped, he is prepared to abandon the ship, and continue his route over the ice. He takes with him fuel and supplies for two years.

The Voyage of the "Windward."—The *Windward*, Captain Samuel Bartlett, carrying to the far north a fresh supply of stores of all kinds for the Peary expedition, sailed from Sydney, Cape Breton, on July 20 last. Under favourable conditions, it was hoped that Etah, in North Greenland, Peary's base of operations, would be reached in three weeks from the date of departure; but subsequent reports show that unexpected difficulties, involving a serious delay, have been encountered. The *Windward*, as reported in a telegram from St. John's on July 31, had met with an accident to her machinery, and had, besides, found the ice off the Labrador coast so heavy that doubts were entertained as to the success of the voyage.

GENERAL.

Geography at Oxford.—The programme of arrangements for the approaching Michaelmas Term has been issued by the Oxford School of Geography. The proposed courses of lectures, by which the year's instruction for the University Diploma of Geography will be opened, will deal with the following subjects: "The Historical Geography of the British Islands" and "The Development of Geographical ideas" will be dealt with by Mr. Mackinder; "The Atmospheric Circulation," by Mr. Dickson; "The Geographical Cycle," by Dr. Herbertson; and "The Geographical Development of the Roman Empire," by Mr. Grundy. In addition to these courses (which commence during the third week in October), students will be able to avail themselves of instruction on Practical Astronomy and Physical Geography by University professors, while practical instruction will be given at the laboratory. The first diploma examination will take place in June, 1901. It has been decided to offer annually a scholarship of the value of £60, which will be open to members of the University of Oxford who have taken honours in one of the Final schools of the University. The examination for this will be held on October 9, 1900, and candidates must send in their names to Mr. Mackinder not later than October 3.

The Silk-production of the World.—An interesting sketch of the past history and present condition of the silk-producing industry throughout the world is given in the *Annales de Géographie* for March 15, by Prof. V. Groffier. After briefly describing the methods of culture and pointing out the geographical causes by which the industry is localized, the writer passes under review the different regions of production, giving an account of the introduction of the industry in each, and estimating the prospects of future development. Maps are given showing both the general distribution of silk-culture and, more in detail, the extent of production in each country in proportion to the area devoted to the industry. The most productive regions of Asia (Central China and Japan) yield, in certain districts, more than 50 kilogrammes of silk per square kilometre of surface under cultivation (about 285 lbs. to the square mile), while in India the tract of country at the head of the Ganges delta produces over 25 kilogrammes to the same area. Syria, Asia Minor, Persia, and Turkestan also supply silk for export. In Europe, although the culture is prosecuted more or less throughout the Mediterranean countries, it is only in Southern France and Northern Italy that it assumes great importance. In other parts of the world the industry is at present in an experimental stage, but indications of future development are not wanting. In Africa, though experiments made in the north have not led to great results, the industry promises favourably in the south, especially in Natal. In Mexico and neighbouring parts of Central America the climate is eminently suitable, while in the United States, Southern Brazil, the Argentine, and in most of the Australasian colonies, silk-rearing is practised on a small scale. Prof. Groffier thinks that it is the European industry which has most to suffer from the extension of silk-growing in other countries,

while in Asia the production has probably not yet reached its maximum. Fortunately, however, for the cultivation in France and Italy, the finest silks of all are produced by species of *bombyx* peculiar to those countries.

New Colonial Publication.—Under the title *Koloniale Zeitschrift*, a new serial publication has been this year started in Germany, which, while devoting itself principally to German colonial affairs, promises to be not without interest from a wider point of view. The standpoint adopted is that of an independent organ, which, while distinctly a friend of German colonial undertakings, will not hesitate to criticize impartially, when necessary, the methods and aims adopted by those responsible for colonial development. It will give information as to the world's commerce and colonial affairs generally, besides devoting special attention to foreign countries in which German interests predominate or promise to be of importance in the future. Articles which have appeared already deal with such subjects as the relations of Germany and Great Britain; the policy of expansion of the United States; the question of Morocco; and the German and Italian colonies in Brazil. The editor is Dr. Hans Wagner, and the place of publication Leipzig.

OBITUARY.

H.R.H. The Duke of Saxe-Coburg and Gotha.

BEYOND the feelings of regret, and sympathy with the Queen in her bereavement, which we share with the nation at large on the occasion of the death of the Duke of Saxe-Coburg and Gotha, better known to Englishmen as the Duke of Edinburgh, our Society is affected in a special degree by the sad event, owing to the official connection which had so long existed between His Royal Highness and the Society. The late Duke had been our Honorary President for just a quarter of a century, having been elected by the Council to that post in 1875. It was in the following year that he for the first time presided over a meeting of the Society, on the occasion of the reception accorded to the late Commander Cameron, on his return from his great journey across Africa. The Duke's choice of the naval profession, taking him as it did into the most diverse quarters of the globe, brought him into close touch with geographers, and on the occasion referred to a special fitness for the post of President arose from the fact that the young traveller belonged to the same profession. Entering the navy in 1850, at the age of 14, as midshipman in the *Euryalus*, Prince Alfred became lieutenant in 1863, captain three years later, and rear-admiral in 1876. From that time he held one post after another, until in 1886 he attained the coveted position of Commander of the Mediterranean Fleet, with the rank of full admiral. While still serving in the *Euryalus*, he had visited the South African colonies, and he afterwards made cruises to North America, the West Indies, and the Mediterranean. While in command of the *Galatea* frigate, his first ship, he made a long voyage to Australia, where he met with an enthusiastic reception, afterwards visiting Japan, China, and India.

Captain M. S. Wellby, 18th Hussars.

It is with great regret that we record the death, from wounds received in battle in South Africa, of Captain M. S. Wellby, one of the most intrepid and successful of the younger generation of explorers, and an officer of great promise in his

professional career. On the outbreak of hostilities last autumn, Captain Wellby, who had only just returned from his Abyssinian expedition (*ante*, p. 292), was at once sent out to join his regiment. He passed through the whole siege of Ladysmith, and was subsequently attached to General Buller's force in the Transvaal. On July 30 he was dangerously wounded in an engagement at Mertzicht, and died at Paardekop on August 5.

Captain Wellby was born in October, 1866, being the second son of Mr. J. H. Wellby, of 1, Sussex Place, Regent's Park. He was educated at Rugby and Sandhurst, and received his commission as lieutenant in the 18th Hussars in August, 1886, becoming captain in 1894, and adjutant of his regiment in 1897, a position which he held until August, 1898. His exploring instincts first found scope in 1894, in which year he undertook his first expedition in Somaliland, reaching the Dolbahanta country, which he revisited in 1895. In 1896 he started on the journey, this time in Asia, which first made him widely known as a bold and enterprising traveller. At that time, in spite of the attention which had been devoted to Tibet as a field for exploration, a large area in the north-west had remained quite untraversed by Europeans. Those travellers who, in the previous decade, had begun to lift the veil from Northern Tibet—Bonvalot, Littledale, and De Rhins—had all followed parallel routes running from north to south, and had none of them touched the western third of the region. To cross this in its greatest extent at right angles to the routes of his predecessors, was the task which Captain Wellby set himself—a task which was most successfully carried out by him and his friend Lieut. Malcolm, who were thus the first to open a way from west to east between the great snowy ranges of the Kuen-lun system, though the feat was soon afterwards repeated, in part, by Dr. Sven Hedin. The greater part of the journey was through an entirely uninhabited region over 15,000 feet in elevation, the natural difficulties of the route being enhanced by scarcity of water and food (the travellers having at one time to subsist largely on wild onions) and the desertion of the men. Captain Wellby described this journey at a meeting of the Society in June, 1898, having in 1897 taken part with distinction in the military operations on the north-west frontier of India. In 1898 also appeared his more extended narrative under the title 'Through Unknown Tibet.'

In the autumn of 1898 Captain Wellby started on the expedition from Abyssinia to Lake Rudolf and the Nile, which was described to the Society in June last, of which the full report appears in the present number of the *Journal*. The deceased traveller had a singularly modest and unassuming manner of describing his exploits, the value of which might thus escape the notice of the chance reader, though fully recognized by the initiated. Another pleasing characteristic was his fairness and tact in dealing with native races, which enabled him to pass unscathed, where many would have met with obstruction and violence.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., LL.D., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Abh. = Abhandlungen.	Mem. = Memoirs, Mémoires.
Ann. = Annals, Annales, Annalen.	Met. = Meteorological.
B. = Bulletin, Bollettino, Boletim.	P. = Proceedings.
Com. = Commerce.	R. = Royal.
C. Rd. = Comptes Rendus.	Rev. = Review, Revue.
Erdk. = Erdkunde.	S. = Society, Société, Selskab.
G. = Geography, Geographie, Geografia.	Sitzb. = Sitzungsbericht.
Ges. = Gesellschaft.	T. = Transactions.
I. = Institute, Institution.	V. = Verein.
Iz. = Izvestiya.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
k. u. k. = kaiserlich und königlich.	Z. = Zeitschrift.
M. = Mitteilungen.	Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

- France.** *Ann. G.* 9 (1900): 219-228. **Fournier.**
Les réseaux hydrographiques du Doubs et de la Loue dans leurs rapports avec la structure géologique. Par E. Fournier.
- France.** **Gaffarel.**
Les divisions administratives de la France actuelle. Par M. Paul Gaffarel.—Congrès National des Sociétés Françaises de Géographie. XIX^e Session—Marseille—Septembre 1898. Compte-rendu des Travaux du Congrès. Marseille, 1899. Pp. 455-457.
- France.** *C. Rd.* 130 (1900): 1573-1576. **Glangeaud.**
Le volcan de Gravenoire et les sources minérales de Royat. Note de M. Ph. Glangeaud.
- France.** **Roux.**
Le canal de jonction du Rhône à Marseille, voies navigables et voies ferrées. Par M. J. Charles-Roux.—Congrès National des Sociétés Françaises de Géographie. XIX^e Session—Marseille—Septembre 1898. Compte-rendu des Travaux du Congrès. Marseille, 1899. Pp. 324-346.
- France—Currency.**
La Monnaie de Paris à l'Exposition Universelle de 1900. Paris: Imp. Nationale, 1900. Size 7½ × 4½, pp. 84. Presented by M. Auguste Arnaud.
An account of the currency and coinage of France in connection with the exhibit by the Paris Mint at the Paris Exhibition.
- France—Gard.** *La G., B.S.G. Paris* (1900): 365-384. **Martel.**
Padirac. Étude d'hydrologie souterraine. Par M. E. A. Martel. With Plan and Illustrations.
- France—Loire.** **Doby.**
La navigabilité de la Loire, état de la question. Par M. V. Doby.—Congrès National des Sociétés Françaises de Géographie. XIX^e Session—Marseille—Septembre 1898. Compte-rendu des Travaux du Congrès. Marseille, 1899. Pp. 291-300.
- France—Marseilles.** **Estrine.**
Un port franc à Marseille, les enseignements de l'Histoire et les desiderata actuels. Par M. Lucien Estrine.—Congrès National des Sociétés Françaises de Géographie. XIX^e Session—Marseille—Septembre 1898. Compte-rendu des Travaux du Congrès. Marseille, 1899. Pp. 309-324.
- France—Marseilles.** **Masson.**
Marseille port colonial. Par M. Paul Masson.—Congrès National des Sociétés Françaises de Géographie. XIX^e Session—Marseille—Septembre 1898. Compte-rendu des Travaux du Congrès. Marseille, 1899. Pp. 349-373.
- France—Mont Blanc.** *Rev. Scientifique* 13 (1900): 715-720. **Vallot.**
Un projet de chemin de fer du pied au sommet du Mont-Blanc, d'après MM. J. et H. Vallot.
Plan of an underground, electric, cog-wheel railway from Chamonix to a point about 890 feet below the summit of Mont Blanc.

France—Nice.**Harris.**

Trade of Nice and District for the year 1899. Foreign Office, Annual No. 2435, 1900. Size 10×6 , pp. 14. Price 1d.

France—Paris.**Baedeker.**

Paris and environs with Routes from London to Paris. Handbook for travellers by Karl Baedeker. With 12 Maps and 36 Plans. Fourteenth Revised Edition. Leipzig: Karl Baedeker; London: Dulau & Co. 1900. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. lvi. and 420. Price 6 m. Presented by Messrs. Dulau & Co.

France—Wind.**Hautreux.**

Les vents dans les golfes du Lion et de Gascogne. Par M. Hautreux.—Congrès National des Sociétés Françaises de Géographie. XIX^e Session—Marseille—Septembre 1898. Compte-rendu des Travaux du Congrès. Marseille, 1899. Pp. 300–308. Diagram.

On the nature and seasonal variations of the winds on the south and west coasts of France.

France—Wrecks.*Rev. Maritime* 145 (1900): 291–311.

Rapport sur la Statistique des naufrages pour l'année 1896. With Chart.

On the wrecks occurring on the coast of France, with a chart showing the position of each wreck, the name of the vessel, and an indication as to whether the ship was saved or lost.

Germany.*M.V. Erdk. Leipzig* (1899): 1–83.**Haage.**

Die deutsche Nordseeküste in physikalisch-geographischer und morphologischer Hinsicht, nebst einer kartometrischen Bestimmung der deutschen Nordseewatten. Von Reinhold Haage.

An elaborate discussion of the German North Sea coast in its geographical relations, dealing with the definition of a coast, its relations to the land and to the sea, and the changes which it undergoes.

Germany.*Petermanns M.* 46 (1900): 112–116.**Langhans.**

Die wirtschaftlichen Beziehungen der deutschen Küsten zum Meere. Von Paul Langhans. With Map.

On the marine industries pursued by the people along the coasts of Germany.

Germany—Hamburg.**Ward.**

Trade of Hamburg and District for the year 1899. Foreign Office, Annual No. 2431, 1900. Size $10 \times 6\frac{1}{2}$, pp. 90. Price 5d.

Germany—Inland Navigation.**Gallouédéc.**

A travers le Monde, Tour du Monde 6 (1900): 169–172, 177–180.

La Navigation intérieure en Allemagne. Par M. L. Gallouédéc. With Maps.

Germany—Prussia.

Veröffentlichung des Königl. Preussischen Geodätischen Institutes. Neue Folge No. 1. Die Polhöhe von Potsdam. II. Heft. Berlin: P. Stankiewicz, 1900. Size $11\frac{1}{2} \times 9$, pp. 58. Plates. Presented by the K. Geodätisches Institut.

As the outcome of 4390 individual observations, the latitude of the centre of the great dome of the observatory at Potsdam is deduced as $52^{\circ} 22' 55''$.92.

Greece—Corfu.**Claparède.**

Corfou et les Corfiotes. Par Arthur de Claparède. Genève: H. Kündig; Paris: Librairie Fischbacher. 1900. Size $7\frac{1}{2} \times 5$, pp. x. and 178. Price 3 fr. Presented by the Author.

M. de Claparède, observing that there is no recent book on Corfu in the French language, has by this graceful little volume endeavoured to fill the gap. He touches on the physical features of the island, summarizes the history, and describes its present condition and the objects of interest it contains.

Iberian Peninsula—History. *O Instituto* 47 (1900): 257–262, 321–327.**Garofalo.**

Contributi alla storia delle provincie occidentali dell' impero Romano. Per Francesco P. Garofalo.

Iceland.*M.V. Erdk. Leipzig* (1899): 85–141.**Schumann.**

Islands Siedlungsgebiete während der landnámatið. Von Oskar Schumann. With Map.

Amongst the numerous sources referred to in this study of the anthropogeography of Iceland at an early period we miss the compendious 'Historical Geography of Iceland,' by Th. Thoroddson.

- Iceland.** *G. Tidkrift* 15 (1900): 93-121. Thoroddsen.
Jordskjælv i Islands sydlige Lavland, deres geologiske Forhold og Historie. III.
Af Dr. Th. Thoroddsen.
On earthquakes in the southern lowlands of Iceland.
- Italy.** *Atti R.A. Lincei, Rendiconti* 9 (1900): 329-336. Giacomelli.
Sulla latitudine di Monte Mario. Nota di F. Giacomelli.
- Italy—Bergamo Alps.** Hoepli.
Manuali Hoepli. Guida-Itinerario alle Prealpi Bergamasche compresa la Valsassina ed i passi alla Valtellina ed alla Valcamonica, colla prefazione del Prof. A. Taramelli. Terza Edizione. Text and Maps. Milano: Ulrico Hoepli, 1900. Size 6 x 4½, pp. xlviii. and 242. *Maps and Illustrations.* Price 6.50 lira. *Presented by the Publisher.*
An elegant and practical guide-book; the text, illustrated by pictures and a geological map on a small scale, gives all the information any tourist or mountaineer could wish. The maps, in a separate cover, include one of the whole of the Bergamo Alps on the scale of 1:100,000, including the data of a number of sheets of the military map, and one printed in four colours on twice the scale (more than 1 inch to the mile) of the central district, showing with exceptional distinctness all the roads divided into four classes, and also the mule-tracks, the ordinary footpaths, and the difficult mountain tracks. The price (less than 5s.) is remarkably low.
- Italy—Hydrographic Surveys.**
Annali Idrografici. Raccolta di documenti e notizie circa l'Idrografia e la Navigazione, pubblicati per cura dell'Istituto Idrografico della R. Marina. Volume i. Anno 1900. Genova, 1900. Size 11 x 8, pp. 134. *Charts and Diagrams.* *Presented by the R. Istituto Idrografico.*
- Italy—Sardinia.** *Atti R.A. Lincei, Rendiconti* 9 (1900): 345-349. Pampaloni.
I terreni carboniferi di Seui ed oolitici della Perdaliana in Sardegna. Nota di L. Pampaloni.
On the coal-measures of Sardinia.
- Italy—Sicily.** *Riv. G. Italiana* 7 (1900): 273-285. Marinelli.
Conche lacustri dovute a suberosioni nei gessi in Sicilia. Appunti di Olinto Marinelli. *With Map.*
The map shows the distribution of caves in Sicily.
- Norway—Climate.** *Videnskabs. Skrifter* (1899) (No. 5): 1-36. Mohn.
Klima-Tabeller for Norge. V.—XII. Af H. Mohn.
- Norway—Place-Names.** *Petermanns M.* 46 (1900): 118-119. Nielsen.
Das neueste Werk über die geographische Onomatologie Norwegens. Von Prof. Dr. Yngvar Nielsen.
- Pyrenees.** Guénot.
Les inondations de 1897 et les effets du déboisement des Pyrénées, par M. S. Guénot.—Congrès National des Sociétés Françaises de Géographie. XIX^e Session—Marseille—Septembre 1898. *Compte-rendu des Travaux du Congrès.* Marseille, 1899. Pp. 274-290.
Brings forward evidence from the Pyrenees of the disastrous results of destroying the forests on mountain slopes in the immediate increase in the frequency and destructiveness of floods.
- Pyrenees.** *Alpine J.* 20 (1900): 87-102. Spender.
The High Pyrenees. By Harold Spender. *With Illustrations.*
- Rumania—Historical.** *B.S.G. Română* 20 (1899): 41-70. Jorga.
Documente geografice, De D. N. Jorga. *With Illustrations.*
Documents relating to historical changes in Rumanian territory. One of the illustrations is the reproduction of a map of the neighbourhood of Jassy in 1788.
- Rumania—Transylvanian Alps.** *B.S.G. Română* 20 (1899): 83-86. Martonne.
Sur la période glaciaire dans les Karpates méridionales. Par M. E. de Martonne.
- Rumania—Transylvanian Alps.** *B.S.G. Română* 20 (1899): 87-90. Martonne.
Sur l'histoire de la vallée du Jiu (Karpates méridionales). Par M. E. de Martonne.

- Russia.** *National G. Mag.* 11 (1900): 169-184. **Grosvenor.**
The Growth of Russia. By Edwin A. Grosvenor. *With Maps.*
The author is professor of Modern Governments and their Administration in Amherst College, and he treats the growth of Russia from the point of view of its political individuality.
- Russia—Crimea.** *Contemporary Rev.* 78 (1900): 38-57. **Norman.**
In the Haunted Crimea. By M^{lle} Muriel Norman.
A visit to sites of historic interest in the Crimea.
- Russia—Finland.** *Bidrag Finlands Natur o. Folk* 58 (1900): 1-45. **Kihlman.**
Pflanzen phänologische Beobachtungen in Finland 1895. Zusammengestellt von A. Oaw. Kihlman.
On the dates of the budding, flowering, ripening, etc., of plants in different parts of Finland.
- Russia—Finland.** *Bidrag Finlands Natur o. Folk* 58 (1900): 73-110. **Lagerborg.**
Finland i utländsk historisk literatur. Bibliografiska meddelanden af Rolf Lagerborg.
A bibliography of works appearing on Finland in foreign languages.
- Russia—Finland.** *Bidrag Finlands Natur o. Folk* 58 (1900): 47-72. **Stenroos.**
Thierphänologische Beobachtungen in Finland 1895. Zusammengestellt von K. E. Stenroos.
On the dates of the arrival, breeding, and departure of migratory birds and other animals.
- Russia—Finland.** *Bidrag Finlands Natur o. Folk* 58 (1900): 275-346. **Wiik.**
Om de primitiva formationernas geologi med särskild hänsyn till Finlands geologiska förhållanden. (*Résumé.*) Af F. J. Wiik.
On the primitive geological formations in Finland.
- Russia—Finland.** *Bidrag Finlands Natur o. Folk* 58 (1900): 111-274. **Westerlund.**
Själfmorden i Finland 1861-1895. Statistisk sammanställning af F. W. Westerlund. *With Map and Diagrams.*
Statistics of suicide in different parts of Finland and at different periods of the century.
- Russia—New Russia.** *Rev. G.* 46 (1900): 321-335, 401-415. **Baye.**
En Nouvelle Russie. Souvenirs d'une mission. Par le Baron de Baye. *With Illustrations.*
- Russia—Poland.** **Murray and Kimens.**
Trade of Poland and Lithuania for the Year 1899. Foreign Office, Annual No. 2425, 1900. Size 10 × 6, pp. 40. *Price 2½d.*
The Consuls say, "The unbroken failure of British merchants to compete with other countries in the supply of the Russian market may be put down to two causes—ignorance and obstinacy."
- Spain.** **Various Authors.**
L'Espagne, politique, littérature, armée et marine, justice, enseignement, économie, finances, ethnographie, colonies, beaux-arts, la cour, la société, etc. Numéro spécial encyclopédique de la Nouvelle Revue Internationale. Préface: La Patrie Espagnole, par Madame Rattazzi. Quatrième édition. Paris: Librairie Nilsson, 1900. Size 10½ × 6½, pp. 248. *Illustrations.* *Price 7.50 fr.* *Presented by the Publisher.*
- Sweden—Gothenburg.**
Göteborgs Turistförenings Årsskrift för Åren 1899 och 1900. Göteborg, 1900. Size 8½ × 6½, pp. 114. *Map and Illustrations.* *Price 1.50 kr.* *Presented by the Gothenburg Tourist Association.*
- United Kingdom—England.** **Baddeley.**
Thorough Guide Series. The English Lake District. By M. J. B. Baddeley, B.A. With 18 Maps, Panoramas, etc. (Corrected up to date from the Ordnance Survey.) By Bartholomew. Eighth edition. London: Dulau & Co., 1899. Size 6½ × 4½, pp. xxx., 248, and 18. *Price 5s. net.* *Presented by the Publishers.*
This edition has been enlarged and rendered more complete than ever.
- United Kingdom—England.** *Brit. Assoc. Rep.* (1899): 479-488. **Coode and Matthews.**
Dover Harbour Works. By J. C. Coode and W. Matthews. *With Plan.*
On the plan of the great national harbour of refuge now being built at Dover.

United Kingdom—England.**Nares.**

Report on the Present State of the Navigation of the River Mersey (1899), to the Right Honourable the Commissioners for the Conservancy of the River Mersey. By Vice-Admiral Sir G. S. Nares, K.C.B., F.R.S. London, 1900. Size $10 \times 6\frac{1}{2}$, pp. 20. *Presented by the Mersey Conservancy.*

United Kingdom—Geological Photographs. *Brit. Assoc. Rep.* (1899): 377-397. —

Photographs of Geological Interest in the United Kingdom. Tenth Report of the Committee.

United Kingdom—Imports and Exports. *Contemporary Rev.* 77 (1900): 716-727. **Mulhall.**

Imports and Exports of 40 Years. By M. G. Mulhall.

A statistical paper comparing the weight and value, both as total sums and per head of the population, of certain selected imports and exports at intervals of ten years between 1859 and 1899.

United Kingdom—Meteorology. *J. Scottish Meteorolog. S.* 11 (1900): 290-298. **Mossman.**

Barometric and Thermometric Gradients between London and Edinburgh, 1764-1898. By R. C. Mossman. *With Diagrams.*

For the years 1764-1898 the mean annual temperature of London was $50^{\circ}2$, and of Edinburgh $46^{\circ}8$, a difference of $3^{\circ}4$; the average temperature in Edinburgh was $5^{\circ}4$ lower than that of London in August, but only $0^{\circ}8$ in January. The mean pressure at sea-level and 32° for the period 1774-1898 was 29.952 inches in London, and 29.855 in Edinburgh, a difference of 0.097 inch, the difference being greatest in February and least in May.

United Kingdom—Ordnance Survey.**Farquharson.**

Twelve Years' Work of the Ordnance Survey, 1887 to 1899. By Colonel Sir John Farquharson, K.C.B. (From the *Geographical Journal* for June, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 34. *Diagrams.*

United Kingdom—Scotland.**Baddeley.**

Thorough Guide Series. Scotland (Part i.): Edinburgh, Glasgow, and the Highlands as far north as Aberdeen, Inverness, Gairloch, and Stornoway, with a description of the various approaches by land and sea from the south. By M. J. B. Baddeley, B.A. Forty-nine Maps and Plans by Bartholomew. Ninth Edition. London: Dulau & Co., 1900. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. xxxii. and 346. *Price 6s. 6d. net. Presented by the Publishers.*

Enlarged and improved, with admirable orographical maps, the colouring of which, however, has the defect of inverting the usual convention of using dark green for low ground and merging into brown through light green.

United Kingdom—Scotland.**Baddeley.**

Thorough Guide Series. Orkney and Shetland, with approaches from Edinburgh, Aberdeen, Thurso, and the Western Highlands. By M. J. B. Baddeley, B.A. Ten Maps by Bartholomew. Fourth edition. London: Dulau & Co., 1900. Size 7×5 , pp. viii. and 64. *Price [paper covers] 1s. net. Presented by the Publishers.*

United Kingdom—Scotland—Rainfall.**Buchan.**

J. Scottish Meteorolog. S. 11 (1900): 251-283.

The Annual Rainfall of Scotland from 1800 to 1898. By Dr. Alexander Buchan.

Tables are given showing the total rainfall in inches for each year from 1800 to 1840 for 23 stations, and for each year from 1840 to 1898 for 298 stations in Scotland, the greater number of which, however, only give records from 1860 onwards. Another table gives for each station the number of years observed, the average rainfall, and the dates and corresponding readings of the wettest and driest years and the three driest consecutive years.

United Kingdom—Wales. *Geolog. Mag.* 7 (1900): 204-215, 241-245.**Lake.**

Bala Lake and the River System of North Wales. By Philip Lake. *With Maps and Sections.*

An abstract with discussion is given in the *Q.J. Geological S.* 56 (1900): 230-232.

Western Europe—Sailing Directions.

Sailing Directions for the West Coasts of France, Spain, and Portugal from Ushant to Gibraltar, including Gibraltar Strait, and the African Coast from Ceuta to Mogador. Sixth Edition, 1900. London: J. D. Potter, 1900. Size $9\frac{1}{2} \times 6$, pp. xxviii. and 648. *Index Chart. Price 4s. Presented by the Admiralty.*

Western Europe—Rhine.**Baedeker.**

The Rhine from Rotterdam to Constance. Handbook for Travellers by Karl Baedeker. With 45 Maps and 25 Plans. Fourteenth Revised Edition. Leipzig: Karl Baedeker; London: Dulau & Co., 1900. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. xxxiv. and 448. Price 7m. Presented by Messrs. Dulau & Co.

ASIA.**Chinese Turkestan.***Meteorolog. Z.* 17 (1900): 193-202.**Woeikof.**

Klima von Luktschun, Centralasien. Von A. Woeikof.

On the peculiar climatic conditions of this remarkable depression in the Turfan oasis.

Dutch East Indies.**Kan.**

Les études scientifiques concernant les possessions Néerlandaises aux Indes Orientales 1883-1900. Par C. M. Kan. (Exposition Universelle à Paris 1900. Extrait du Guide à travers la Section des Indes Néerlandaises, Groupe xvii.) Size $8\frac{1}{2} \times 6$, pp. 14. Presented by the Author.

This deals with the scientific studies carried out in the Dutch East Indies between 1883 and 1900.

India.*J.S. Arts* 48 (1900): 569-585.**Baines.**

The Industrial Development of India. By J. A. Baines.

An important discussion on the future of industrial occupations in India.

India—Assam.

Returns of the Rail and River-borne Trade of the Province of Assam for the quarter ending September 30, 1899. Shillong, 1899. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 118.

India—Assam.**Basu.**

Note on the Lac Industry of Assam. By B. C. Basu. (Agricultural Department, Assam. Bulletin No. 6. Industrial Series No. 1.) Shillong, 1900. Size $10 \times 6\frac{1}{2}$, pp. 14.

India—Burma.*P.R. Artillery J.* 27 (1900): 65-74.

The Arracan Expedition, 1825. From the diary of an artillery officer. With Map.

India—Burma.**Ferrars.**

Burma. By Max and Bertha Ferrars. London: Low & Co., 1900. Size $11\frac{1}{2} \times 9$, pp. xii. and 238. Map and Illustrations. Price 30s. net. Presented by the Publishers.

A strikingly artistic book in binding and illustrations, this volume deals with the life of the Burmese people from birth to death, every stage in the narrative being illustrated by photographs, the total number of which mounts up to 455. A few short appendices summarize some more technical matters. The book is something quite unusual, and gives a very realistic impression of native life; it is greatly to the credit of the artist that not one of the pictures contains the representation of a European: the subject dealt with is Burmese Burma.

India—Historical.**King.**

Indian Antiquary 28 (1899): 119, 141, 180, 209, 235, 277, 305; 29 (1900): 4.

History of the Bahmani Dynasty. By Major J. S. King. With Map.

The map shows the political divisions of the Dakhan (Deccan) as it was in 1565.

India—Historical.*Ann. G.* 9 (1900): 251-257.**Malavialle.**

La carte de l'Inde d'après Pomponius Mela. Par L. Malavialle. With Map.

A criticism of the attempts made by various authorities to give cartographic expression to the description of India in the Chorographia of Pomponius Mela, together with the author's rendering.

India—Kashmir.*Q.J. Geolog. S.* 56 (1900): 337-369.**McMahon.**

Notes on the Geology of Gilgit. By Lieut.-Gen. C. A. McMahon. With Plate.

India—Kashmir.*Alpine J.* 20 (1900): 122-127.**Neve.**

The Ascent of Haramouk. By Dr. Ernest F. Neve. With Illustrations.

India—Madras Observations.**Smith.**

Results of Observations of the Fixed Stars made with the Madras Meridian Circle, under the direction of the late Norman Robert Pogson. By C. Michie Smith, B.Sc. Vol. ix. General Catalogue. Madras, 1899. Size $12\frac{1}{2} \times 10$, pp. xxviii. and 314. Presented by the Madras Observatory.

- India—Water-supply.** *Blackwood's Mag.* 167 (1900): 658-665. ———
 Value of the Water of the Great Rivers of India.
 Enforcing the vital value of water in Indian agriculture.
- India and Persia.** *P.R. Artillery I.* 27 (1900): 115-120. ———
 The Western Glacis of India. *With Map.*
 A recent journey by a British officer from Quetta through Baluchistan to Sistan, and thence northward to Duruksh, in Persia.
- Korea.** *Imp. and Asiatic Quarterly Rev.* 10 (1900): 154-167. **Salwey.**
 Korea, the Pearl of the Orient: Traditional, Historical, Descriptive. By Charlotte M. Salwey.
- Malay Archipelago.** ———
Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 304-310.
 De Siboga-Expeditie.
 On the proceedings of the *Siboga* deep-sea expedition in the waters of the Malay archipelago from September 28, 1899, to January 2, 1900.
- Malay Archipelago.** **Wichmann.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 226-233.
 De Doif-eilanden (Jef Doif) door Arthur Wichmann. *With Map.*
 On the controversy as to the existence of the Doif islands between Gilolo and New Guinea.
- Malay Archipelago—Borneo.** **Nieuwenhuis.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 177-204.
 Tweede reis van Pontianak naar Samarinda in 1898 en 1899. Door Dr. A. W. Nieuwenhuis. *With Illustrations.*
- Malay Archipelago—Sumatra.** **Pleyte.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 205-225.
 Herinneringen uit oost-Indië. Door C. M. Pleyte. *With Illustration.*
 A journey from Padang to Kota Baroe *via* Sawah-Loentoh.
- Russia—Bokhara.** *Scottish G. Mag.* 16 (1900): 357-368. **Rickmers.**
 Bokhara. By W. R. Rickmers. *With Illustrations.*
- Russia—Caucasus.** **Radde.**
 Die Sammlungen des Kaukasischen Museums, im Vereine mit Special-Gelehrten bearbeitet, und herausgegeben von Dr. Gustav Radde. Band i. Zoologie. Von Dr. Gustav Radde. Tiflis, 1899. Size 12½ x 9, pp. 520. *Portrait, Maps, and Plates.* [In Russian.] *Presented by Dr. Radde.*
 A catalogue of the zoological collections in the Tiflis Museum, with numerous photographs of the specimens, and maps showing their distribution.
- Russia—Caucasus.** **Stevens.**
 Trade of Batoum and District for the year 1899. Foreign Office, Annual No. 2424, 1900. Size 10 x 6, pp. 24. *Price 1½d.*
 The congestion of the Baku-Batum railway has led to a rapid increase in the importance of Novorossisk as a place of export for oil from Baku, which was sent by tank-steamer on the Caspian to Petrovsk, and thence by the railway north of the Caucasus to the Black Sea port.
- Russia—Railways.** **Gourdet.**
 Le chemin de fer en Asie Centrale: Jonction du Transcaspien avec le Transsibérien. Par M. Paul Gourdet.—Congrès National des Sociétés Françaises de Géographie. XIX.^e Session—Marseille—Septembre 1898. *Compte-rendu des Travaux du Congrès.* Marseille, 1899. Pp. 256-274.
 On the proposed line to connect the Siberian railway with the Trans-Caspian.
- Russia—Siberia.** *Petermanns M.* 46 (1900): 116-118. **Krahmer.**
 Bogdanowitsch' Ochotskisch-Kamtschatkasche Bergexpedition 1895-98. Von General Krahmer.
- Russian Central Asia.** *G. Tidskrift* 15 (1900): 121-149. **Olufsen.**
 Den anden danske Pamir-Expedition. Ved Premierløjtnant Olufsen. *With Map and Illustrations.*
 Lieut. Olufsen describes his journey down the Amu-darya by boat to Khiva from Charjui.

Turkey—Bussorah.

Trade of Bussorah for the year 1899. Foreign Office, Annual No. 2428, 1900. Size 10 × 6, pp. 10. Price 1d.

Wratislaw.

Western Asia.

Vom Mittelmeer zum Persischen Golf, durch den Haurān, die Syrische Wüste und Mesopotamien. Von Dr. Max Freiherrn von Oppenheim. Zweiter Band. Berlin: Dietrich Reimer (Ernst Vohsen), 1900. Size 9½ × 7, pp. xiv. and 434. Maps and Illustrations. Presented by the Publisher.

Oppenheim.

This volume deals with journeys in Mesopotamia and on the shores of the Persian gulf, with much valuable information regarding the Bedawin and a series of maps.

AFRICA.**British West Africa—Ashanti.**

The Downfall of Prempeh. A diary of life with the Native Levy in Ashanti, 1895-96. By Major-General R. S. S. Baden-Powell. London: Methuen & Co., 1900. Size 9 × 6, pp. 126. Sketch-map and Illustrations. Price 6d. Presented by the Publishers.

Baden-Powell.

Cape Colony—Forests. *T. South African Phil. S. 11 (1900): 53-66.*

Hutchins.

Cape National Forests. By D. E. Hutchins.

Cape Colony—Kimberley. *T. South African Phil. S. 11 (1900): 77-112.*

Sutton.

The Winds of Kimberley. By J. R. Sutton. With Diagrams.

Cape Colony—Kimberley. *T. South African Phil. S. 11 (1900): 7-17.*

Sutton.

Do the mining operations affect the climate of Kimberley? By J. R. Sutton.

Experiments are described which were carried out in order to test the effect on climate of covering many square miles of red sandy soil near Kimberley with the blue clay from the diamond-mines. It was found that the air is always warmer above the blue ground than it is above the red sand, and that comparison of the air-temperatures at Kenilworth and Kimberley show that Kimberley, surrounded by the blue ground, was much the warmer from September to March (the summer months), and cooler from April to August. It is pointed out that the trees surrounding Kenilworth may have contributed to this effect.

Central Africa.

Pearce.

Notes on the Country between Lake Chiuta and the River Luli, Central Africa. By Captain F. B. Pearce. (From the *Geographical Journal* for June, 1900.) Size 10 × 6½, pp. 10. Map and Illustrations.

Congo Basin. *Mouvement G. 17 (1900): 265-267.*

La région des bas-fonds de l'ancienne mer intérieure du haut Congo. With Map.

Congo State.

Bentley.

Pioneering on the Congo. By the Rev. W. Holman Bentley. 2 vols. London: The Religious Tract Society, 1900. Size 9 × 5½, pp. (vol. i.) 478; (vol. ii.) 448. Map and Illustrations. Price 16s. net. Presented by the Religious Tract Society.

This tells the story of the growth of the Congo State from the first establishment of missions in 1879 down to the present day, and it is written by almost the last survivor of the pioneers whose labours made the great achievements of recent years possible. There are numerous illustrations and a map showing the position of the mission stations in the Congo basin.

Egypt.

Worsfold.

The Redemption of Egypt. By W. Basil Worsfold, M.A. London: G. Allen, 1899. Size 10 × 7½, pp. xviii. and 334. Illustrations. Price 25s. net.

The title refers to the reorganization of Egyptian affairs. The information is the result of a visit to Egypt in 1898-99.

Egypt—Gold Mining.

Alford.

Egyptian Mines Exploration. A Report on Ancient and Prospective Gold Mining in Egypt. By Charles J. Alford. London: Waterlow & Sons, 1900. Size 10½ × 8½, pp. 40. Maps, Plans, and Illustrations. Presented by the Author.

Egypt—Historical. *J. Asiatique 15 (1900): 80-96, 201-253.*

Weill.

L'art de la fortification dans la haute antiquité égyptienne. Par M. Raymond Weill. With Plans.

French Somaliland. *Rev. G. 46 (1900): 375-379, 456-463.*

Barré.

Djibouti et Obock. Par M. P. Barré.

French West Africa.

Bohn.

Le développement économique de nos Colonies de l'Afrique occidentale. Par M. Frédéric Bohn.—Congrès National des Sociétés Françaises de Géographie. XIX^e Session—Marseille—Septembre 1898. *Compte-rendu des Travaux du Congrès.* Marseille, 1899. Pp. 399-411.

French West Africa. *B.E.G. Com. Bordeaux* 26 (1900): 229-243.

Hostains

De la Côte d'Ivoire au Soudan et à la Guinée française. Par M. Édouard Hostains. *With Map.*

A description of a journey from the Ivory Coast through the country north of Liberia and Sierra Leone to Konak, in French Guinea.

French West Africa—Dahomé.

Borelli.

Le Dahomé, ressources économiques et avenir commercial. Par M. Georges Borelli.—Congrès National des Sociétés Françaises de Géographie. XIX^e Session—Marseille—Septembre 1898. *Compte-rendu des Travaux du Congrès.* Marseille, 1899. Pp. 412-431.

German East Africa. *M. Deutsch. Schutzgeb.* 13 (1900): 132-143.

Die Fortschritte der Pendelexpedition.

German East Africa.

Dundas.

Trade of German East African Coast Towns for the year 1899. Foreign Office, Annual No. 2373. 1900. Size 10 x 6½, pp. 38. Price 2½d.

Particulars as to the present state of Tanga, Pangani, Saadani, Bagamoyo, Dar-es-Salaam, Kilwa, Lindi, and Mikindani.

German East Africa. *M. Deutsch. Schutzgeb.* 13 (1900): 144-172.

Kannenberg.

Reise durch die humitischen Sprachgebiete um Kondoa. Von Hauptmann Kannenberg. *With Map.*

German East Africa. *M. Deutsch. Schutzgeb.* 13 (1900): 115-126.

Richter.

Notizen über Lebensweise, Zeitrechnung, Industrie und Handwerk der Bewohner des Bezirks Bukoba. Von Hauptmann Richter.

German East Africa. *M. Deutsch. Schutzgeb.* 13 (1900): 174-183.

Schmitt.

Geographische Ortsbestimmungen in Ostafrika, Ausgeführt vom Geographen R. H. Schmitt.

German South-West Africa. *M. Deutsch. Schutzgeb.* 13 (1900): 109-114.

Resultate der meteorologischen Beobachtungen in Swakopmund im Jahre 1899.

German South-West Africa. *T. South African Phil. S.* 11 (1900): 19-33. Watermeyer.

Notes on a Journey in German South-West Africa. By J. C. Watermeyer.

The object of this journey was to study the agricultural and pastoral prospects of the country.

German West Africa—Kamerun.

Stein and Moisel.

M. Deutsch. Schutzgeb. 13 (1900): 93-108.

Erläuterungen zu meinen Reisen in Süd-Kamerun (1895 bis 1899). Von Oberleutnant Freiherrn v. Stein. *With Map.*

Begleitworte zu der Karte: Aufnahmen des Oberleutnants Freiherrn v. Stein zu Lausnitz im südlichen Kamerungebiet in den Jahren 1895 bis 1899. Von Max Moisel.

German West Africa—Togo. *M. Deutsch. Schutzgeb.* 13 (1900): 91-92.

Cohn.

Geographische Ortsbestimmungen von Dr. Kersting im Hinterlande von Togo. Berechnet von Dr. Fritz Cohn.

Gold Coast—Northern Territories.

Northcott.

Report on the Northern Territories of the Gold Coast. Compiled by the late Lieut.-Colonel H. P. Northcott, C.B., from Reports furnished by officers of the Administration. Intelligence Division, War Office. London: Printed by Harrison & Sons, 1899. Size 9½ x 6, pp. 164. *Presented by the War Office.*

Lagos.

Denton.

Lagos. Report for 1898. Colonial Reports, Annual No. 284, 1899. Size 10 x 6, pp. 20. Price 1½d.

Madagascar.

C. Rd. 130 (1900): 1229-1231.

Colin.

Positions géographiques et observations magnétiques sur la côte orientale de Madagascar. Note du P. Colin.

The position and magnetic constants are given for Vatomandry, Marosika, and Mahanoro. The charts were found to be in error to the extent of 4' to nearly 5½' in longitude, and from 1' to nearly 2½' in latitude.

Madagascar. *J. Asiatique* 15 (1900): 278-296. **Gautier.**

Les Hova sont-ils des Malais? Essai d'une étude Comparative entre les dialectes Hova et Sakalava. Par M. E. F. Gautier.

The author argues that the evidence of the Malagasy language being related to the Malayo-Polynesian group is absolute, but that the bulk of the people of Madagascar are akin, not to the Malays, but to the Polynesians, and especially to the Papuans.

Madagascar. **Grandidier.**

Voyage de la Reine Ranaivalona 1^{re} à Manerinerina. Par G. Grandidier. (Extrait de la Revue de Madagascar, numéro du 10 janvier 1900.) Paris, 1900. Size 9½ × 6½, pp. 16. *Presented by the Author.*

Describes a royal progress of the queen of Madagascar in 1845.

Madagascar. **Jumelle.**

Les forêts et les casernes forestières exploitables à Madagascar. Par M. Henri Jumelle.—Congrès National des Sociétés Françaises de Géographie. XIX^e Session Marseille—Septembre 1898. Compte-rendu des Travaux du Congrès. Marseille, 1899. Pp. 432-442.

Marocco. **Giraud.**

Itinéraires de Mogador à Marrakech. Par M. Hubert Giraud.—Congrès National des Sociétés Françaises de Géographie. XIX^e Session—Marseille—Septembre 1898. Compte-rendu des Travaux du Congrès. Marseille, 1899. Pp. 507-622. *Map.*

Marocco. *La G., B.S.G. Paris* (1900): 437-448. **Weisgerber.**

Études géographiques sur le Maroc. Par le Dr. Weisgerber. *With Map, Plan, and Illustrations.*

Marocco—Casablanca. *Ann. Hydrographie* 28 (1900): 245-247. ———

Casablanca. Bearbeitet nach dem Reisebericht S.M.S. Charlotts, etc. *With Plan.*

Marocco—Mogador. *Ann. Hydrographie* 28 (1900): 242-245. ———

Mogador. Bearbeitet nach dem Reisebericht S.M.S. Charlotte, etc., ergänzt nach englischen Quellen. *With Plan.*

North Central Africa. **Lloyd.**

In Dwarf Land and Cannibal Country. A Record of Travel and Discovery in Central Africa. By A. B. Lloyd. With Introduction by the Rt. Hon. Sir John H. Kennaway, Bart., M.P. London: T. Fisher Unwin, 1900. Size 8½ × 6, pp. xxiv. and 386. *Maps and Illustrations.* Price 6s. *Presented by the Publisher.*

A full, interesting, and well-illustrated record of a journey across Africa through the heart of the equatorial forest-belt. The journey is referred to in the *Journal* for 1899, vol. xiii. p. 195.

Portuguese East Africa. *Mouvement G.* 17 (1900): 277-281. **Levêque.**

Le Zambèze et le Shire. Par M. Levêque. *With Map.*

On the navigability and conditions of travelling on the rivers Zambezi and Shire, with times and fares of the steamers.

Portuguese East Africa—Beira. **McMaster.**

Trade of Beira for the year 1899. Foreign Office, Annual No. 2427, 1900. Size 10 × 6, pp. 18. Price 1½d.

Portuguese East Africa—Macombe's Country. *J.S. Arts* 48 (1900): 343-351. **Peters.**

Macombe's Country (South of the Zambezi), its Ancient Goldfields and Industrial Resources. By Dr. Carl Peters.

Sahara—Tidikelt. *La G., B.S.G. Paris* (1900): 355-364. **Flamand.**

Mission au Tidikelt, archipel Touatien. Résultats scientifiques généraux. Par M. G. B. M. Flamand. *With Illustrations.*

The author boldly extends the metaphor of the desert as a sea of sand by talking of a group of oases as an archipelago.

Sahara—Tidikelt. *Ann. G.* 9 (1900): 233-242. **Flamand.**

Une mission d'exploration scientifique au Tidikelt. Par G. B. M. Flamand. *With Map.*

The object of this mission was to study the caravan routes and halting-places and the nature of the trade across the Sahara between Algeria and the Sudan.

- Sokotra.** *Brit. Assoc. Rep.* (1899): 460-464. —
Exploration of Sokotra. Report of the Committee.
The facts referred to in this report are given in the *Geographical Journal*, vol. xiii. (1899), p. 633.
- Somaliland.** *Pearce.*
Rambles in Lion Land. Three Months' Leave passed in Somaliland. By Captain Francis B. Pearce. London: Chapman & Hall, 1898. Size $8\frac{1}{2} \times 6$, pp. xii. and 260. *Map and Illustrations.* Price 10s. 6d. *Presented by the Author.*
A pleasant narrative of a hunting-trip from Berbera southward to nearly 8° N., the boundary of the Somali protectorate before the cession to Abyssinia in 1897.
- Somaliland.** *P. Zoolog. S.* (1900): 4-63. *Peel.*
On a Collection of Insects and Arachnids made in 1895 and 1897. By Mr. C. V. A. Peel, in Somaliland, with Descriptions of New Species. *With Plates.*
This article includes a short narrative of Mr. Peel's expeditions in Somaliland in 1895 and 1897.
- South Africa.** *Tijds. K. Ned. Aard. Genoots. Amsterdam* 17 (1900): 273-301. *Aitton.*
De Oranje Vrijstaat. Eene schets van Land en Volk door D. Aitton.
This article gives a general description of South Africa, though devoting most attention to the country between the Orange and Vaal rivers.
- South Africa.** *Fortnightly Rev.* 67 (1900): 860-871. *Dicey.*
South African Reconstruction. By Edward Dicey, c.b.
Considers the present conditions of South Africa, especially with regard to the composition of the white population.
- South Africa.** *National G. Mag.* 11 (1900): 186-192. *Simpson.*
Influence of Geographical Conditions on Military Operations in South Africa. By Major W. A. Simpson. *With Map.*
- South Africa—Climate.** *J. School G.* 4 (1900): 208-211. *Herbertson.*
The Climate of South Africa. By A. J. Herbertson.
- South Africa—Coal.** *T. South African Phil. S.* 11 (1900): 67-74. *Dunn.*
Notes on the Dwyka Coal Measures at Vereeniging, Transvaal, etc. By E. J. Dunn, F.G.S. *Map.*
The map shows the outcrop of the Dwyka coal-measures throughout its whole extent in South Africa.
- Tunis.** *Fallot.*
La situation économique de la Tunisie. Par M. Ernest Fallot.—Congrès National des Sociétés Françaises de Géographie. XIX^e. Session—Marseille—Septembre 1898. Compte-rendu des Travaux du Congrès. Marseille, 1899. Pp. 465-485. *Diagram.*
- Tunis.** *Vassel.*
Le lac de Bou-Grara et la pénétration. Par M. E. Vassel.—Congrès National des Sociétés Françaises de Géographie. XIX^e. Session—Marseille—Septembre 1898. Compte-rendu des Travaux du Congrès. Marseille, 1899. Pp. 485-489. *Map.*
- Uganda Railway.** —
Africa. No. 4 (1900). Memoranda relating to Uganda Railway, 1900. London: Eyre & Spottiswoode. Size $13 \times 8\frac{1}{2}$, pp. 10. Price $1\frac{1}{4}$ d.

NORTH AMERICA.

- Canada—Ornithology.** *Macoun.*
Geological Survey of Canada. Catalogue of Canadian Birds. Part i. Water Birds, Gallinaceous Birds, and Pigeons. By John Macoun. Ottawa, 1900. Size $10 \times 6\frac{1}{2}$, pp. viii. and 218. *Presented by the Geological Survey of Canada.*
- Canada—Yukon District.** *McConnell.*
Geological Survey of Canada. Preliminary Report on the Klondike Gold Fields, Yukon District, Canada. By R. G. McConnell, B.A. Ottawa, 1900. Size 10×7 , pp. 44. *Map and Illustrations.* *Presented by the Geological Survey of Canada.*
An official account of the Yukon gold-fields, published in advance of the next report of the Canadian Geological Survey.
- Canada—Yukon River.** *Scottish G. Mag.* 16 (1900): 321-341. *Tyrrell.*
The Basin of the Yukon River in Canada. By J. B. Tyrrell. *With Map and Illustrations.*

Canada—Yukon Territory. *National G. Mag.* 11 (1900): 199-201. **Hayes and Brooks.**
Ice Cliffs on White River, Yukon Territory. By C. Willard Hayes and Alfred H. Brooks.

This is a severe criticism of the conclusions put forward by Mr. M. W. Gorman in the same magazine for March, 1900.

Mexico. *Scottish G. Mag.* 16 (1900): 342-352. **Howarth.**
The Cordillera of Mexico and its Inhabitants. By O. H. Howarth. *With Illustrations.*

Mexico—Lower California. *Ann. G.* 9 (1900): 243-250. **Dignet.**
La Basse-Californie d'après M. Léon Dignet. *With Illustrations.*

North America—Western. **Petitot.**
Du Territoire d'Alberta à l'État d'Iowa par le Far-West. Par M. l'Abbé Émile Petitot.—Congrès National des Sociétés Françaises de Géographie. XIX^e Session—Marseille—Septembre 1898. Compte-rendu des Travaux du Congrès. Marseille, 1899. Pp. 135-153.

Rocky Mountain Region. *P. American A. Arts and Sci.* 35 (1900): 345-373. **Davis.**
The Freshwater Tertiary Formations of the Rocky Mountain Region. By W. M. Davis.

United States—Chattanooga District. **Hayes.**
Physiography of the Chattanooga district, in Tennessee, Georgia, and Alabama. By C. W. Hayes.—Nineteenth Annual Report of the U.S. Geological Survey, 1897-98. Part ii. Pp. 1-58. *Maps.* Washington, 1899.

United States—Indian Territory. **Taff, White, and Girty.**
Geology of the McAlester-Lehigh Coal-field, Indian Territory, by Joseph A. Taff, accompanied by a Report on the Fossil Plants by David White, and a Report on the Palaeozoic Invertebrate Fossils, by G. H. Girty.—Nineteenth Annual Report of the U.S. Geological Survey, 1897-98. Part iii. Pp. 423-593. *Plates.* Washington, 1899.

United States—Michigan. **Clements, Smyth, Bayley, Van Hise.**
The Crystal Falls Iron-bearing District of Michigan. By J. M. Clements and H. L. Smyth. With a chapter on the Sturgeon River Tongue, by W. S. Bayley, and an Introduction by C. R. Van Hise.—Nineteenth Annual Report of the U.S. Geological Survey, 1897-98. Part iii. Pp. 1-151. *Maps and Illustrations.* Washington, 1899.

United States—Michigan. *American J. Sci.* 9 (1900): 434-438. **Lane.**
The Geothermal Gradient in Michigan. By Alfred C. Lane.
Observations on the temperature in deep artesian wells.

United States—Nebraska. **Darton.**
Preliminary Report on the Geology and Water Resources of Nebraska West of the One Hundred and Third Meridian. By N. H. Darton.—Nineteenth Annual Report of the U.S. Geological Survey, 1897-98. Part iv. Pp. 719-785. *Maps and Illustrations.* Washington, 1899.

United States—New York and Vermont. **Dale.**
The Slate Belt of Eastern New York and Western Vermont. By T. N. Dale.—Nineteenth Annual of the U.S. Geological Survey, 1897-98. Part iii. Pp. 153-307. *Maps and Plates.* Washington, 1899.

United States—Ohio. **Orton.**
The Rock Waters of Ohio. By E. Orton.—Nineteenth Annual Report of the U.S. Geological Survey, 1897-98. Part iv. Pp. 633-717. *Illustrations.* Washington, 1899.
On the water-bearing rocks of Ohio.

United States—Oregon. **Diller.**
The Coos Bay Coal-field, Oregon. By J. S. Diller.—Nineteenth Annual Report of the U.S. Geological Survey, 1897-98. Part iii. Pp. 309-376. *Maps and Illustrations.* Washington, 1899.

United States—Pennsylvania. **Powell.**
Trade of Philadelphia for the year 1899. Foreign Office, Annual No. 2433, 1900. Size 9½ x 6, pp. 30. *Price* 2d.

United States—Stream Measurements.**Newell and others.**

Report of progress of stream measurements for the calendar year 1897, including papers by Dwight Porter, J. B. Lippincott, and other Hydrographers. By F. H. Newell.—Nineteenth Annual Report of the U.S. Geological Survey, 1897-98. Part iv. Pp. 1-632. *Maps and Illustrations*. Washington, 1899.

United States—Utah.**Tower and Smith.**

Geology and Mining Industry of the Tintic district, Utah. By G. W. Tower, jun., and G. O. Smith.—Nineteenth Annual Report of the U.S. Geological Survey, 1897-98. Part iii. Pp. 601-767. *Plates*. Washington, 1899.

CENTRAL AND SOUTH AMERICA.**Brazil.****Pio di Savoia.**

Gli Italiani nel sud dello Stato di S^{ta} Caterina. Rapporto del cav. Gherardo (dei principi) Pio di Savoia.—Bollettino del Ministero degli Affari Esteri. April, 1900. Roma, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 16.

On the condition of the Italian "colonies" in Southern Brazil.

Chile.**Z. Ges. Erdk. Berlin 35 (1900): 1-76.****Krüger.**

Die chilensishe Refihue-Expedition. Ein Beitrag zur Erforschung der Patagonischen Anden. Von Dr. Paul Krüger. *With Map*.

Description of an expedition up the Rio Refihue and across the Andes region to the Rio Futaleufu in 1896-97.

Dutch West Indies.**Kan.**

Les colonies Néerlandaises dans les Indes Occidentales. Par C. M. Kan. (Exposition Universelle à Paris 1900. Extrait du Guide à travers la Section des Indes Néerlandaises) (Group xvii.). Size $8\frac{1}{2} \times 6$, pp. 18. *Presented by the Author*.

Guatemala and Mexico—Yucatan.**Maudslay.**

Biologia Centrali-Americana. Edited by F. Ducane Godman. Archaeology. By A. P. Maudslay. Part xii. (Plates), January, 1900 (Vol. ii, Plates xxv.-xlix.); Ditto, Part xiii. (Text and Plates), April, 1900 (Vol. iii, pp. 25-43, Plates xxvi.-li.). London: R. H. Porter and Dulau & Co. Size (Text) $13 \times 10\frac{1}{2}$, (Plates) $13\frac{1}{2} \times 20\frac{1}{2}$.

Jamaica.

Further Correspondence relating to the Finances and Government of the Island of Jamaica. London: Eyre & Spottiswoode, 1900. Size $13 \times 8\frac{1}{2}$, pp. 50. Price 5 $\frac{1}{2}$ d.

Paraguay.**Gosling.**

Trade of Paraguay for the year 1899. Foreign Office, Annual No. 2426, 1900. Size 10×6 , pp. 12. Price 1d.

This report passes in review the resources of Paraguay, the population of which is now said to be 550,000.

Patagonia. Tour du Monde 6 (1900): 193, 205, 217, 229, 241, 253.**La Vaulx.**

Voyage en Patagonie. Par M. le Comte Henry de La Vaulx. *With Map and Illustrations*.

A finely illustrated account of a recent journey in Patagonia, the pictures referring mainly to the natives and their modes of life.

Patagonia—Andes. Verh. Ges. Erdk. Berlin 27 (1900): 194-220.**Steffen.**

Herr Prof. Dr. Hans Steffen: Reisen in den Patagonischen Anden. *With Maps*.

South America.**Petermanns M. 46 (1900): 121-142.****Sievers.**

Die geographische Erforschung Südamerikas im 19 Jahrhundert. Von W. Sievers. *With Maps*.

AUSTRALASIA AND PACIFIC ISLANDS.**Hawaii.****Twombly.**

Hawaii and its People. The Land of Rainbow and Palm. By Alexander S. Twombly. New York, Boston, Chicago: Silver, Burdett & Co.; London: Gay & Bird, 1900. Size $7\frac{1}{2} \times 5$, pp. 384. *Map and Illustrations*. Price 5s. *Presented by Messrs. Gay & Bird*.

A history of Hawaii for young readers, derived from the original sources. The author resided for a year in the islands, and so acquired a personal knowledge of the native character which enables him to give an air of actuality to the compilation.

Mapia Islands. *A travers le Monde, Tour du Monde* 6 (1900): 189-190.

Les îles Mapia. *With Map.*

History of these islands off New Guinea which are claimed by Germany as attached to the Carolines.

New Caledonia. *Rev. Française* 25 (1900): 321-330.

Sainte-Marie.

La colonisation en Nouvelle-Calédonie. Par M. L. de Sainte-Marie.

South Australia—Aborigines. *P. American Philosoph. S.* 39 (1900): 78-93. Mathews.

Divisions of the South Australian Aborigines. By R. H. Mathews. *With Map.*

Torres Straits. *Brit. Assoc. Rep.* (1899): 585-592.

The Anthropology and Natural History of Torres Straits. Report of the Committee.

The important part of this report is the appendix containing six short papers by Dr. Haddon and the members of his expedition.

Western Australia. *P. American Philosoph. S.* 39 (1900): 123-125.

Mathews.

Native Tribes of Western Australia. By R. H. Mathews.

POLAR REGIONS.

Arctic—Bering Sea.

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No. 116. [U.S.] Hydrographic Office. Ice and Ice Movements in Bering Sea during the Spring Months. By James Page. Washington, 1900. Size $9\frac{1}{2} \times 6$, pp. 20. *Map. Presented by the U.S. Hydrographic Office.*

This is noted in the *Journal* for July, vol. xvi. p. 110.

Greenland.

Kornerup.

Aperçu des "Meddelelser om Grønland" (Communications sur le Grønland) 1876-1899, par la Commission dirigeant les recherches géologiques et géographiques du Grønland, rédigé par Thorvald Kornerup, traduit par Euch. Barnél. Copenhague: C. A. Reitzel, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 62. *Map. Presented by the Author.*

Spitsbergen.

Conway

Some Unpublished Spitsbergen MSS. By Sir Martin Conway. (From the *Geographical Journal* for June, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 8. *Illustrations.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geology—Age of Earth. *Geolog. Mag.* 7 (1900): 220-225.

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The Geological Age of the Earth. By J. Joly.

On the bearing of the argument from the solution of rocks and the salinity of the ocean on the estimation of the age of the Earth.

Geomorphology. *La G., B.S.G. Paris* (1900): 429-436.

Lapparent.

L'œuvre de M. Suess. Par A. de Lapparent.

A review of Prof. Suess' great work, 'Das Antlitz der Erde,' in its French translation.

Geomorphology. *Z. Deutsch. u. Österreich. Alpenv.* 30 (1899): 18-27.

Richter.

Gebirgshebung und Thalbildung. Von E. Richter. *With Illustration.*

A popular account of the origin of mountain scenery, illustrated by the special case of the district surrounding the Gross Venediger.

Geophysics. *C. Rd.* 130 (1900): 1652-1658.

Boussinesq.

Problème du refroidissement de la croûte terrestre, traité au même point de vue que l'a fait Fourier, mais par une méthode d'intégration beaucoup plus simple. Note de M. J. Boussinesq.

Glacial phenomena.

Balch.

Glacières or Freezing Caverns. By Edwin Swift Balch. Philadelphia: Allen, Lane, & Scott, 1900. Size $10 \times 6\frac{1}{2}$, pp. 338. *Illustrations. Presented by the Author.*

This is a monograph on a special subject—glacières or caverns containing ice. It is divided into an account of experiences in exploring such caverns in different parts of the world, a discussion of the cause of subterranean ice, a list of known glacières, a collection of opinions regarding them collected from many authors, and a bibliography of the subject.

Ground Water.

King.

Principles and conditions of the movements of ground water. By F. H. King. Nineteenth Annual Report of the U.S. Geological Survey, 1897-98. Part ii. pp. 59-294. *Plates.* Washington, 1899.

Ground Waters.**Slichter.**

Theoretical Investigation of the Motion of Ground Waters. By C. S. Slichter. Nineteenth Annual Report of the U.S. Geological Survey, 1897-98. Part ii. Pp. 295-384. *Illustrations*. Washington, 1899.

Meteorology.*Petermanns M.* 46 (1900): 97-112.**Hergesell.**

Die Temperatur der freien Atmosphäre. Von Prof. Dr. H. Hergesell. *With Diagrams*.

Meteorology—Observations. *Z. Deutsch. u. Österreich. Alpenv.* 30 (1899): 28-42. **Erk.**

Die wichtigsten Bergobservatorien. Von Fritz Erk.

On high-level mountain observatories.

Meteorology—Pressure.*Meteorolog. Z.* 17 (1900): 207-208.**Woeikof.**

Wo ist der höchste Luftdruck der Erde, mit und ohne Reduktion auf das Meeresniveau? Von A. Woeikof.

The highest barometer-reading ever recorded when reduced to sea-level was 808.7 mm. (31.84 inches) at Bernal, in the government of Tomsk, in January, 1900, the unreduced height being 789.2 mm. (31.07 inches). The highest unreduced reading ever likely to be recorded would be in the Dead sea depression, where a sea-level pressure equal to that at Bernal would read about 812 mm. (31.97 inches).

Ocean Currents.**Russell.**

Current Papers, No. 4. By H. C. Russell. [Read before the Royal Society of N.S. Wales, October 4, 1899.] Size $8\frac{1}{2} \times 5\frac{1}{4}$, pp. [10]. *Charts*.

Particulars are given of the course of a number of drift-bottles in the Southern ocean and round the coast of Australia.

Oceanography.

The Danish Ingolf-Expedition. Vol. i., Part ii. Contents:—(3) O. B. Boeggild: The Deposits of the Sea-bottom; (4) C. F. Wandel: Current-bottles. Published at the cost of the Government by the direction of the Zoological Museum of the University. Copenhagen: H. Hagerup, 1900. Size $13\frac{1}{4} \times 10\frac{1}{4}$, pp. 90 and 6. *Charts*.

Oceanography.*Brit. Assoc. Rep.* (1899): 789-802.**Murray.**

Section E.—Geography. Presidential Address. By Sir John Murray, K.C.B., etc.

This address is reprinted in the *Geographical Journal*, vol. xiv. (1899) 426-441.

Oceanography—Apparatus. *Rev. Maritime* 145 (1900): 536-446.**Buchet.**

Planktonmètre pour pêches pélagiques à grande vitesse. Par G. Buchet.

On an apparatus for measuring the quantity of Plankton in sea-water from a ship proceeding at full speed.

Oceanography—Tides. *Nautical Mag.* 69 (1900): 339-357.**Plumstead.**

Mr. Moxly's Appeal to the Gentiles. By E. Plumstead.

A criticism of Mr. Moxly's theory of the tides as set forth in his book noticed in the *Journal*, vol. xiv. (1899), p. 123.

Phytogeography.*Naturw. Wochenschrift* 15 (1900): 217-220.**Dietel.**

Einiges über die geographische Verbreitung der Rostpilze. Von Dr. P. Dietel.

On the geographical distribution of the fungus which produces rust in grain.

Phytogeography.*G.Z.* 6 (1900): 312-325.**Schimper.**

Bericht über die Fortschritte der Pflanzen-geographie in den Jahren 1896 bis 1898. Von A. F. W. Schimper.

River-regulation. *Z. Deutsch. u. Österreich. Alpenv.* 30 (1899): 110-132.**Strele.**

Die Wildbäche und ihre Verbauung. Von G. Strele. *With Illustrations*.

On mountain torrents and the means of regulating their courses so as to avoid floods.

Seismology.*Brit. Assoc. Rep.* (1899): 161-238.

Seismological Investigations. Fourth Report of the Committee.

Speleology.**Martel.**

La Spéléologie ou Science des Cavernes. Par E.-A. Martel. (Paris: G. Carré et C. Naud, 1900.) Size $8 \times 5\frac{1}{4}$, pp. 126. *Plans*. Price 2 fr. *Presented by the Publishers*.

A compact and systematic little treatise on speleology, or the science of caverns, by the leading French investigator and exponent.

Terrestrial Magnetism.

Lemström.

Öfversigt Finska Vet.-S. Förhandlingar 41 (1898-99): 60-104.

On the earth-currents and the electrical currents in the atmosphere and their relations to the earth-magnetism. Luminous phenomena, natural and artificial, of the nature of the polar light. By Selim Lemström. *With Maps and Illustrations.*

A comprehensive treatise on terrestrial magnetism, and electric currents in and surrounding the Earth.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.**Geographical Discovery.** *Rev. G. Italiana* 7 (1900): 254-272.

Porena.

Lo scoperte geografiche del secolo XIX. del Prof. Filippo Porena.

Historical.

Beazley.

New Light on some Mediaeval Maps (II. and III.). By C. Raymond Beazley, M.A. (From the *Geographical Journal* for February and April, 1900.) Size 10 × 6½, pp. (ii.) 12; (iii.) 12. *Illustrations.*

Historical—Gonneville.

Gaffarel.

Le capitaine Paulmier de Gonneville, et le premier voyage des Français au Brésil. Par M. Paul Gaffarel.—Congrès National des Sociétés Françaises de Géographie. XIX.^e Session—Marseille—Septembre 1898. *Compte-rendu des Travaux du Congrès.* Marseille, 1899. Pp. 154-173.

Describes and discusses the voyage of de Gonneville to Brazil in 1503.

Maritime People.

Schwerin.

Om Kustfolks olika sjöduglighet. Af H. H. von Schwerin. Lund, 1900. Size 11½ × 9, pp. 104. *Presented by the Author.*

On coast-dwellers of unequal devotion to sea-faring, considered in connection with the physical nature of the country they inhabit.

Medical Geography. *B.S.G. Română* 20 (1899): 15-38.

Stefănescu.

Paludismul din punct de vedere geografic. De D. Dr. J. Stefănescu. *With Maps.*

On the distribution of malaria, with maps showing the relative frequency of occurrence of cases in Rumania, Europe, and the world.

GENERAL**Bibliography.** *P.R.S. Queensland* 15 (1900): 75-81.

Shirley.

A Reply to "Some Critical Notes on the Queensland Volume of the International Catalogue of Scientific Literature." By John Shirley, B.Sc.

This states the other side of the case referred to in vol. xv. (1900), p. 447.

Bibliography—Geology.

Geological Literature added to the Geological Society's Library during the Year ended December 31, 1899. London: Geological Society, 1900. Size 9 × 5½, pp. 176. Price 2s. *Presented by the Geological Society.*

British Empire. *Imp. and Asiatic Quarterly Rev.* 10 (1900): 87-100.

Roe.

The Constitutional Relations of England and her Dependencies. By Sir Charles Roe.

Dutch Colonies.

Exposition Universelle Internationale de 1900 à Paris. Guide à travers la section des Indes Néerlandaises. Groupe xvii. (Colonisation). La Haye, 1900. Size 9 × 6, pp. xx. and 454. *Maps. Presented by Prof. Dr. C. M. Kan.*

In this guide there are included not only catalogues of the exhibits of the Dutch East Indies, but also an explanation of the reasons which led to the planning of the exhibit as a whole, the intention being to present as complete a picture as possible of the Dutch possessions in the Far East.

Education.

Vincent.

Réforme de l'Enseignement de la Géographie. Par M. le Dr. J. Vincent.—Congrès National des Sociétés Françaises de Géographie. XIX.^e Session—Marseille—Septembre 1898. *Compte-rendu des Travaux du Congrès.* Marseille, 1899. Pp. 203-214.

Suggests increased attention to geographical education in order to encourage colonial enterprise.

Education.

Blunt.

General Intelligence Papers, with Exercises in English Composition. By Gerald

Blunt. London: A. M. Holden [1900]. Size $7\frac{1}{2} \times 5$, pp. viii. and 122. *Price 2s. Presented by the Author.*

A collection of miscellaneous questions, a few touching on elementary geography, all easy for any schoolboy to ask, but some difficult for any one to answer.

Educational—Methods. *National G. Mag.* 11 (1900): 192-199. **Kelton**
Apperception in Geography. By M. E. Kelton.

Presenting a scheme of geographical teaching in schools based on observation and the use of maps.

French Colonies. *National G. Mag.* 11 (1900): 225-238. **Bracq.**

The Colonial Expansion of France. By Prof. Jean C. Bracq. *With Map.*

A historical study of colonial policy in France.

French Colonies. **Lee.**
French Colonies. Foreign Office, Miscellaneous, No. 520, 1900. Size 10×6 , pp. 92. *Price 5d.*

This bulky report omits consideration of Tunis, which is under the French foreign office as a protected state, and also of Indo-China, the French possessions in India, St. Pierre, and Miquelon, on account of the small relative importance of their British trade.

French Colonies. **Monteil.**
Conférence de M. le Colonel Monteil sur le Domaine colonial de la France.—
Congrès National des Sociétés Françaises de Géographie. XIX^e. Session—
Marseille—Septembre 1898. *Compte-rendu des Travaux du Congrès.* Marseille,
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French Colonies. *Ann. G.* 9 (1900): 229-232. **Pelet.**
Un nouvel "Atlas des colonies françaises." Par P. Pelet. *With Map.*

Description by the compiler of a new French colonial atlas, illustrated by a specimen plate.

French Geographical Congress.
Société de Géographie de Marseille. Congrès National des Sociétés Françaises de
Géographie. XIX^e. Session—Marseille—Septembre 1898. *Compte-rendu des*
Travaux du Congrès. Marseille, 1899. Size $10 \times 6\frac{1}{2}$, pp. 540. *Presented by the*
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The papers of special importance are entered separately in the bibliography.

Geographical Year-book. **Wagner.**
Geographisches Jahrbuch. XXII. Band, 1899. Herausgegeben von Hermann
Wagner. Zweite Hälfte. Gotha: Justus Perthes, 1900. Size $8\frac{1}{2} \times 6$, pp. viii.
and 245-472. *Price 7 mark 50 pf.*

This instalment contains a report on the progress of our knowledge of the distribution of animals since 1889, by Dr. A. E. Ortmann; and reports on recent works (1897-99) on Australia and Polynesia and on Africa, by Prof. F. Hahn; non-Russian Asia, by Dr. E. Tiessen; Latin America, by Prof. W. Sievers; North America, by Prof. B. Weigand; and a geographical Necrology for 1898-99, by Prof. W. Wolkenhauer.

Moravian Missions.
Periodical Accounts relating to the Moravian Missions. No. 41. Vol. iv. March,
1900. London. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 233-292 and xxix-liv. *Map. Price 4d.*

Mountaineering. **Whymper.**
A Letter addressed to the Members of the Alpine Club. London, 1900. Printed for
Private Circulation. Size $8\frac{1}{2} \times 6$, pp. 16. *Illustration. Presented by the Author.*

Place-names. *P.S. Biblical Archaeology* 22 (1900): 120-121. **Offord.**
Note on the Geography of Phœnician Inscriptions. By Joseph Offord.

This short note refers to evidence afforded by inscriptions to the effect that the ancient Phœnicians were in the habit of giving the names of places in their native country to similar features in their colonies.

Place-names. *Scottish G. Mag.* 16 (1900): 368-375. **Richardson.**
River Terminology. By Ralph Richardson.

The title is misleading, as the paper deals with nomenclature, not terminology. The author discusses the origin of common river-names, showing the affinity between them and the various changes they have undergone.

Water-supplies. **Veerén.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 234-272.

De beteekenis van de wateren der aarde als drinkwater. Door F. E. L. Veeren.

On the methods of water preservation and supply in all parts of the world.

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Miscellaneous:—County Diagram, Yorkshire (North Riding), printed in colours, 2 miles to 1 inch. 3s.

(E. Stanford, Agent.)

Historical Atlas.

Poole.

Historical Atlas of Modern Europe, from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lane Poole, M.A., PH.D., Fellow of Magdalen College,

No. III.—SEPTEMBER, 1900.]

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and Lecturer in Diplomatic in the University of Oxford. Part xxvi. Oxford: The Clarendon Press; London, Edinburgh, Glasgow, and New York: Henry Frowde, M.A.; Edinburgh: W. & A. K. Johnston. 1900. *Price 3s. 6d. Presented by the Clarendon Press.*

Twenty-five parts of this atlas are now published out of the thirty which it will comprise altogether. This part contains map No. xvii., England and Wales in 1086; No. lxiv., Italy, circa 850-1067; No. lxxxii., the Ottoman Empire in Europe, 1356-1897. Each map is accompanied by descriptive letterpress, that for the first-mentioned map being by Prof. James Tait, M.A.; the second by Miss Lina Eckenstein; and the third by Mr. W. Millar, M.A. These notes are somewhat brief, but are, however, sufficient to explain the maps without attempting to give a complete history of the special periods and subjects dealt with.

ASIA.

China, etc.

Johnston.

W. & A. K. Johnston's Map to illustrate the Chinese Question. Scale 1: 6,198,300 or 97.8 stat. miles to an inch. W. & A. K. Johnston, Edinburgh and London, 1900. *Price 1s. Presented by the Publishers.*

This sheet of maps and plans will be useful to newspaper readers and others at the present time in assisting them to follow events that are taking place in the Far East. There are altogether fifteen maps and plans on the sheet.

China.

Kinder.

Map showing the Imperial Railways of North China, and proposed extensions. Scale 1: 1,350,000 or 21.4 stat. miles to an inch. C. W. Kinder, Engineer-in-Chief. *Presented by the Author.*

China, Japan, and Korea.

Stanford.

Stanford's Map of Eastern China, Japan, and Korea. Scale 1: 6,969,600 or 110 stat. miles to an inch. London: E. Stanford, 1900. *Price 3s. Presented by the Publisher.*

Now that the attention of the public is so much occupied with matters in China, this map will no doubt prove useful for general reference. It would, however, have been more satisfactory if it had been drawn on a separate projection instead of being taken from a map embracing a much larger area, as unnecessary distortion would thus have been avoided. The limits of the territory recently leased to Great Britain to the north of Hongkong might also have been shown. In addition to the general map, there is an inset plan of the country around Peking.

AFRICA.

North-West Africa.

Stanford.

Stanford's Map of Morocco, Algeria, Tunis, and parts of Tripoli, Senegal, and the Military Territories of the Western Sudan. Scale 1: 5,977,382 or 94.3 stat. miles to an inch. London: E. Stanford, 1900. *Price 3s. Presented by the Publisher.*

This is the north-west part of Stanford's large map of Africa, published separately to illustrate recent boundary questions. The eastern boundary of Morocco as defined by the treaty of March 18, 1845, is laid down, together with the south-west boundary of that country, which is shown in conformity with the agreement concluded between the Vizier of Morocco and H.M. Minister at Tangier, March 13, 1895. The map is not quite up to date in some respects, but it will doubtless be useful, especially in connection with the disputed boundary between Algeria and Morocco.

South Africa.

Wood and Ortlepp.

Map of the Northern Portion of the Transvaal, with parts of Bechuanaland, Rhodesia, and Portuguese East Africa. ("Briton or Boer") Northern extension. Scale 1: 1,267,200 or 20 stat. miles to an inch. Wood and Ortlepp, Cape Town and Johannesburg, 1900. *Price 7s. 6d.*

In the *Geographical Journal* for May last, the southern portion of this map, which contained the Orange State, Natal, and adjacent territories, was noticed. The present sheet, on the same scale as the other, is an extension of the map to the north, and includes the northern part of the Transvaal, the southern portion of Rhodesia, Bechuanaland, and Portuguese East Africa. It cannot be said to compare altogether favourably with the southern sheet, and bears evidence of having been hurriedly produced. There are no projection lines, and the degrees of latitude and longitude are not indicated.

Transvaal.

Melville.

Map of the Vereeniging-Pretoria portion of the Transvaal. Sheets: Klip River, Johannesburg, Springs, Krugersdorp. Scale 1: 59,500 or 1.06 inch to a mile.

E. H. V. Melvill, M.I.C.E., etc., Consolidated Gold Fields of South Africa, Cape Town. *Presented by E. H. V. Melvill, Esq., M.I.C.E.*

These sheets form part of a map of the Southern Transvaal, in the neighbourhood of Vereeniging and Pretoria, which is now being compiled for the Military Intelligence Department by Mr. E. H. V. Melvill, of the Consolidated Gold Fields of South Africa Survey Department. The scale is sufficiently large to make the map of real practical value to the troops in South Africa, and Mr. Melvill, who is himself well acquainted with the country, has doubtless made use of the best material at his disposal.

West Africa.

Moisel.

Das Konzessionsgebiet der Gesellschaft Nord-west-Kamerun. Ausgeführt im Auftrage der Gesellschaft Nordwest-Kamerun zu Berlin. Bearbeitet von Max Moisel. Scale 1:500,000 or 7·8 stat. miles to an inch. Berlin, 1900. Kommissionsverlag von Dietrich Reimer (Ernst Vohsen). Four sheets. Price 12 marks.

All available information appears to have been utilized in the compilation of this map, which has been prepared for the society whose territory it especially represents. The whole area included extends from 3° 30' to 9° 30' N. lat., and from 8° 30' to 13° 40' E. long. The map is printed in colours, and shows travellers' routes, together with the dates of their journeys, while altitudes along the routes are given in metres. All government and military stations are underlined in red, and boundaries are indicated.

AMERICA.

Canada.

Surveyor-General's Office, Ottawa.

Sectional Map of Canada. Scale 1:190,080 or 3 stat. miles to an inch. Sheet 21, Swan River. Surveyor-General's Office, Ottawa, 1900. *Presented by the Surveyor-General of Canada.*

AUSTRALIA.

West Australia.

Wells.

Map showing the Route and Discoveries of the Calvert Exploring Expedition in Western Australia. Equipped by Albert F. Calvert, F.R.G.S., London. Commanded by L. A. Wells, of S.A. Survey Department, 1896-97. Scale 1:1,000,000 or 15·8 stat. miles to an inch. Surveyor-General's Office, Adelaide, 1898. Two sheets. *Presented by the South Australian Branch of the Royal Geographical Society of Australasia.*

This map includes the portion of Western Australia extending from 17° to 28° 40' S. lat., and 117° 40' to 127° 20' E. long. Previous to the expedition under Mr. Wells the region had been traversed by several explorers, but much of it remained unexplored. The earlier travellers, with the exception of the Hon. D. Carnegie, part of whose route is included in the north-east of the map, had all crossed the country in an east-and-west direction; but, as Mr. Wells travelled from south to north, his work is important as filling in the previously unexplored gaps between the earlier routes. In addition to the route followed by the expedition, the map gives numerous notes upon the character of the country, water obtainable, positions of places observed, etc. It is in two sheets, and has been prepared at the Surveyor-General's office, Adelaide.

GENERAL.

French Colonies.

Pelet.

Atlas des Colonies Françaises. Dressé par ordre du Ministère des Colonies. Par Paul Pelet. Paris: Armand Colin & Cie. Livraison II. Price 3 fr.

This is the second part of Pelet's 'Atlas des Colonies Françaises,' and contains the following maps: No. 8, Sénégal, scale 1:1,000,000, with a plan of the country round Timbuktu on the same scale. No. 11, the eastern sheet of a map of West Africa on the scale of 1:3,000,000, including the region between the great bend of the Niger on the north and the coast on the south, and extending from Cape Three Points on the west to the Niger delta on the east. The southern portion of Dahomey is also given on this sheet as an inset, on the scale of 1:1,000,000. No. 24 contains maps of the French possessions in the West Indies and the islands of St. Pierre and Miquelon, Newfoundland. It consists of a map of Guadeloupe, Martinique, etc., on the scale of 1:500,000, and five insets. The maps are very creditably produced in colours, and on those of Africa, travellers' routes are given in red.

PHOTOGRAPHS.

Central Asia.

Morse.

Seventy-seven Photographs taken in Mongolia and Russian Central Asia, by Isidor Morse, Esq., 1899. *Presented by Isidor Morse, Esq.*

This is a set of little "Kodak" photographs taken by Mr. Isidor Morse during his travels in Central Asia last year. Although small, they are, generally speaking, remarkably clear, and as the following list of titles will show, some of the subjects are very interesting:—

(1) Framework of tent near river Tekes, Kulja; (2) Mongols; (3) Altai wapiti; (4-6) Mongols; (7) Muzart fort; (8) Two Mongols and Chinese cook; (9) Muzart fort; (10) Two Jesuit missionaries; (11) Mongol wedding; (12) Mongol officers; (13) River Ili; (14) Kurghiz, Kara Kul valley; (15) Carts loaded with coal from Chinese mines at Kulja; (16) Two Jesuit missionaries; (17) Fumigating luggage; (18) Kurghiz looking for game; (19) Crossing the river Ili; (20) Foot-hills of the river Tekes; (21) Fumigating luggage; (22) Courtyard of Armen; (23) Russian-Chinese frontier post; (24) Mongols; (25) Russian posting station near Issik-Kul; (26, 27) Ponies crossing river Tekes; (28) Russian family; (29) Fumigating luggage; (30) Mongol wedding; (31) Mongol ladies; (32) Courtyard, Armen; (32A) Well-to-do Kurghiz; (33) Head of the Kalmuk; (34) Hotel at Tashkent; (35) Kurghiz; (36) Crossing river Ili; (37) Russian-Chinese frontier post; (38) Russian posting station; (39) Turtass; (40) Roe deer heads; (41) Ibex heads; (42, 43) Altai wapiti heads; (44) Jirgalau; (45) Framework of tent; (46) Chinese servant and police; (47) Russian family; (48, 49) Shakirli; (50) Mongols; (51) Large ibex horns; (52) Chinese boy; (53) Kurghiz; (54) Sart cook; (55) Head of the Kalmuks; (56) Chinese soldiers; (57) Roe deer heads; (58) Mongol lady of rank; (59) Mongol; (60) Roe deer; (61) Chinese boy; (62) Tranchi; (63) Chinese cook; (64) Mongol officer; (65-77) no titles.

Transcaucasia.

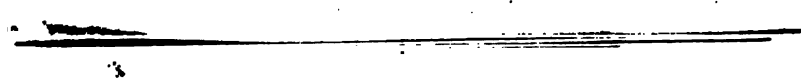
Gulbentian.

Forty-seven Photographs taken in the neighbourhood of the Aras and Kur rivers, Transcaucasia, by C. S. Gulbentian, Esq., 1900. *Presented by C. S. Gulbentian, Esq.*

As will be seen from the following list, these photographs represent the character of the country and mines in the neighbourhood of the river Aras, which constitutes the boundary between Russian Transcaucasia and Persia.

(1) Melik-Azariantz mines at Katar; (2) Valley and river behind Katar Company's old disused refinery; (3) Forest around Shakus; (4) River at Kodghanna; (5) Valley 4 miles from Sharafan; (6) Old bridge at Kuduferin; (7) Old bridge of Kuduferin in distance; (8) New bridge at Kuduferin; (9) River at Kostanla; (10) Specimen of shallows; (11) Main arm of Aras near Maralan; (12) River near Maralan; (13) Russian frontier guards at a river crossing; (14) Aras near Altan; (15) River above Karaduliski; (16) Aras near Karadule-Bazar; (17) River below Karadule-Bazar; (18) Aras, 40 miles above junction with Kur; (19) Mill on Aras 20 miles above junction with Kur; (20) Junction of Aras and Kur at Petropaulskai; (21) River Kur; (22) Kur below Petropaulskai; (23) Forest-clad hills near Katar, with Persian mountains in distance; (24) Hill and dale about 20 miles from Katar; (25) A typical vein outcrop, with young Azarianz, Vahanian, and Kondouroff; (26) Usine de Kondouroff; (27) Usine de Katar; (28) View from the Usine de Katar, showing snow mountains; (29) Hills of Arabatum; (30) Forest of Bartaz; (31) Village of Megri on the Aras, 30 miles from Sunik; (32) The Aras near Megri; (33) Katar; (34) Bashkent and group of miners; (35) Kavart; (36) Kavart, showing quartz rock; (37) The mines of Galizar; (38) General view of the Copper Hill from the south; (39) General view from high hill above Bashkent, showing Copper range and country; (40) The valley of the brook Kavart from one of the Lazareff dumps; (41) The lower reach of the Okti chai; (42) Russian Cossack outpost on the Aras; (43, 44) The Aras just below the mouth of the Okti chai; (45) Zanzezur hills and mountains from the Guivan steppe; (46) Usine de Sunik; (47) Usine de Sunik, showing the valley surrounding it.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



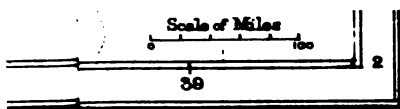
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The Geographical Journal.

No. 4.

OCTOBER, 1900.

VOL. XVI.

THE "SOUTHERN CROSS" EXPEDITION TO THE ANTARCTIC, 1899-1900.*

By C. E. BORCHGREVINK.

It was on December 30, 1898—somewhat sooner than I had expected—that the *Southern Cross* first struck the scouts of the antarctic ice-pack, in lat. $51^{\circ} 56'$ S., long. $153^{\circ} 53'$ E. My experiences of 1894-95 justified the anticipation that we should encounter ice early on the southward voyage by going so far west; in fact, it appears to me that in this locality the ice conditions are always unfavourable. I had, however, purposely taken that course in order to satisfy myself respecting the land reported by Captain Wilkes, and which, it seems clear to me, was, in reality, Balleny. It was an anxious but interesting moment as I watched, from the crow's nest, the vessel as she rose on the swelling ocean and dashed in among the grinding ice-blocks. Trembling and shaking, she forged her way onwards, while the swell grew rapidly less as we successfully pushed into the inner ice-pack.

Since we entered the ice there had met us quite a different bird-life to that seen in the open sea, which had consisted principally of albatrosses (*Diomedea*) of several species, and various petrels, including the mutton-bird (*Estrelata lessoni*) and *Prion vittatus*. The last-named followed us some distance into the ice, but it left us long before we came into the dense pack. A brown-backed bird with a white border to the wings, white underneath, and in body and beak much like a puffin, met us at once when we came into the ice, and was usually seen as long as the ice was slack, but after the pack got denser the bird was seldom to be seen. We saw from time to time specimens of

* Read at the Royal Geographical Society, June 25, 1900. Map, p. 500.
No. IV.—OCTOBER, 1900.]

Ossifraga gigantea, *Oceanites oceanicus*, as well as *Daption capensis*, and some penguins (*Eudyptes adeliæ*). *Pagodroma nivea* and *Thalassoica glacialis* were best represented. Among the seals we saw about this time were two young sea-leopards, as well as some white seals, one specimen of which appeared, from the form of the skull, to be different from the rest, though alike as regard the skin and the size. On January 8 we saw the first specimen of the giant penguin *Aptenodytes forsteri*, but did not succeed in securing it. On January 12 the bird-life was very rich. In the evening Mr. Hanson did some valuable work with the plankton bag, and brought in amongst other things a great many shrimps.

On January 14, 1899, when approximately in $65^{\circ} 42'$ S. and 163° E. long., I entered the crow's nest at midnight, and discovered high snow-clad land to the south. The land stood out sharply in a haze of crimson and gold, which grew more brilliant as the sun rose, until the contours of peaks and crevasses suddenly grasped the beauty of the young day and reflected it out all over the immense ice-pack, where the dark water-pools between the floes changed suddenly from deepest azure to blood red, while the young snow on the ice blushed in delicate crimson. It was Balleny island which we sighted.

The seals which were shot about this time seemed to be far advanced in moulting, and they looked a good deal darker in their new coats. The moulting starts on the back, in a straight line from nose to tail. It is remarkable that neither in the stomachs of the white seals, nor in the intestines, had food of any kind been found. Some few whales had been seen, mostly of the blue kind. On January 16, we were still lying fast in heavy pack, the wind blowing very hard from the south-west. We were in lat. $65^{\circ} 43'$ S., and long. $164^{\circ} 9'$ E. The compass error $26^{\circ} 5'$ E.

On January 18 we saw two large penguins (*A. forsteri*). It was a pair. These birds must have a wonderful power of location, as the male dived when about 600 yards from the vessel, reappearing close by the floe where his mate was seated, the intervening space being covered with ice-floes. On January 20, Mr. Hanson for the first time secured some skuas (*Lestris*). Like other species of *Lestris*, it was very curious, and came close to the side of the vessel. The 21st was noteworthy for the discovery by Mr. Hanson of a new species of seal. The body was not unlike that of the ordinary seal, but the neck was of more than ordinary thickness, and under the chin it extended to a great round muscular purse. The head was short and broad, the eyes large and protruding, and the mouth short. The eyes were somewhat slanting. It had six front teeth in the upper jaw, two in the under jaw, but no back teeth. On January 23 we experienced very heavy ice-pressure, tremendous ice-blocks rising violently against us. The *Southern Cross* sighed and groaned under the pressure brought to bear upon her. She was lifted 4 feet bodily out of the water on one occasion. During this

time Captain Jensen and I spent many cold and anxious hours in the crow's nest. For weeks we remained buried in the snow and ice, and as the summer advanced I began to foresee a possibility of not being able to get through with the vessel. Instead of trying the doubtful chance of getting southwards in the vicinity of Balleny, I determined, after consultation, owing to the advanced season, to work northwards towards open water, with the intention of making a fresh attack on the ice-pack further east. This plan was followed, and after a hard fight in the pack for 48 days, the *Southern Cross* ran into open water, lat. 70° S., and long. 174° E.

On February 15 and 16, the *Southern Cross* was compelled to lie to in a storm of blinding sleet, with decks and rigging covered thick with ice. On the evening of the 16th we sighted land, and entered Robertson bay on the 17th. The rocks of Cape Adare stood out dark and conspicuous as we steamed into the bay. It was a moment which, I believe, will live in the memory of my staff and myself, as we slowly moved towards the low beach whereon man had never attempted to live before. At 11 p.m., for the first time in the world's history, an anchor fell at the last *terra incognita* on the globe. Already while far out at sea it had struck me that the cape and its surroundings seemed much more free from ice and snow than was the case on my first visit in 1894. Then the cape had several feet of ice and snow on the top, now it was absolutely bare. Only here and there were ice-blocks left on the beach; the rest was dark and bare, and on the peninsula itself were the guano deposits, while at this late season only a few penguins were left. After a brief stay on shore, we returned to the vessel, and quickly all was arranged for a speedy commencement of landing our stores, instruments, dogs, and outfit. It was late in the season, and although Robertson bay, to my surprise, was free from ice at that moment, I knew that it might fill up again at any time. Already, on the 18th, we were hard at work landing stores. We lowered the boxes into small whale-boats, and pulled near the shore, where some of us had to wade into the breakers and carry the things ashore. On the 23rd we were suddenly interrupted in our work by a strong gale from the south-east. The gale increased, and developed into a blizzard.

On March 1, the Union Jack, presented by His Royal Highness the Duke of York, was formally hoisted on Victoria Land, greeted with loud cheers from those on shore, and with a salute and dipping of the flag from on board. The following day the *Southern Cross* left us at our pioneer settlement on Cape Adare, which I christened Camp Ridley.

On landing, I had carefully selected and taken on shore with me the following members of my expedition: Lieut. W. Colbeck, R.N.R., magnetic observer; Mr. Nicholai Hanson, zoological taxidermist; Mr. Louis Bernacchi, magnetic observer, astronomer, and photographer; Dr. H. Klovstad, M.A., M.D.; Mr. Hugh Evans, assistant zoologist; Mr. Anton

Fougner, general assistant; Mr. Colbein Ellefsen, cook; the Finn Savio and the Finn Must. I cannot but at once add that in their special departments all of these showed themselves exceptionally zealous and capable, and during the year that we fought shoulder to shoulder in those regions there always existed an honourable rivalry in making each of their several departments as perfect as possible.

On March 12 Mr. Bernacchi and I scaled Cape Adare to the height of 3670 feet, as indicated by the aneroid. The ascent was very steep for the first 800 feet, principally over worn rocks on the mountain-side. On the top there were great mounds of pebbles and large boulders stretching from east to west, on undulating ground. At 800 feet I



CAPE ADARE IN WINTER-TIME.

found vegetation of the very same kind as that seen on the lower rocks of Cape Adare in 1894, but none was seen above this height. The penguins had been up as far as 1000 feet.

About March 13 the temperature, which had previously kept about 22°, began to fall rapidly. Already on the 14th all the penguins had left us, while the skuas (*Lestris*), which were about in great numbers on our arrival, also began to get scarce. On this date Mr. Bernacchi and Mr. Colbeck completed their magnetic observatory in the large Finn tent, which was secured by stays of rope. The meteorological observatory, some 300 yards away from the huts, was also completed at the same time. On March 15 we saw the first Aurora Australis. On the

18th, having brought up all the stores to the house, we organized a preliminary expedition to the top of Cape Adare, whence I hoped to be able to reach the inner part of Robertson bay; but the very first night came on with a hurricane accompanied by driving snow, and we ran the risk of being blown over the cliffs with all our outfit. At camp Ridley the wind had a velocity of 87 miles an hour. At this date Robertson bay was beginning to freeze. The days were spent in frequent meteorological observations, which were taken every second hour, and whenever clear weather permitted, astronomical observations were made, the magnetic work going on whenever the magnetic conditions



THERMOMETER SCREEN.

were favourable. The snowstorms which plunged down from the cape wrapped Cape Ridley in a dense whirl of snow-drift, by which the dogs were completely buried. The ice in the bay was completely ground up, and waves of snow, ice, and water dashed up against the beach and sent the spray flying over the roof of our camp. On April 8, when a heavy gale had ceased, on going along the beach, Mr. Hanson and myself were surprised to find, washed on shore, numberless specimens of medusæ, hydroids, star-fish, and algæ. Can it be that, after all, an extensive shallow-water fauna exists within the antarctic circle?

The roof of our hut we gradually covered over with sealskins, and, in expectation of further gales from the south-east, the eastern sides of

the huts were fortified by a sloping roof of good canvas and seal-skins, weighted down by numberless bags of coal. On April 8 Hanson discovered a fish, and shot a seal, which had fragments of partially digested fish in its stomach. Our health up to that date had been excellent. It was remarkable to see the quick rise and fall in the temperatures, and, considering the near approach of the winter, the temperature was comparatively high. From time to time we caught many fish in the bay. Some were over 12 inches long and about 7 inches in girth. I had photographs taken of all the specimens, and, whenever opportunity offered, photographs were taken of the various peaks on the coast within sight, and cinematograph photos whenever active incidents of interest occurred.

On April 22 I resolved to make a first attempt to penetrate into Robertson bay on the ice, which, though young, was already about 2½ feet thick. I took with me Mr. Fougner, Mr. Bernacchi, and the Finn Savio, provisions for twenty days, twenty sledge-dogs, and one small canvas boat. We left Camp Ridley at 11 a.m., and proceeded over the pack until darkness began to set in. The pack along the cliffs was rather small, and the ice which bound the floes together thin, so we had to proceed with great caution, and, when I at last decided to camp on a small beach at the foot of the perpendicular wall of Victoria Land, I had great difficulty in reaching the spot. The beach, or slope, where we pitched our tent was not 30 yards broad at the widest part, and only some 4 feet above water. From the perpendicular wall of Victoria Land a kind of gravel slide had taken place, and formed a steep slope about 30 feet high from the wall of rocks to the beach. Above us the cliff rose to about 500 feet, at places overhanging the little beach, which seemed completely isolated except by way of the bay. Shortly after landing, a southerly wind rose, which continued to increase till it became a violent gale. At seven the ice began to break up, huge breakers washing over the beach, and we had only just time to save our provisions by carrying them to the top of the gravel slope, where drift snow and ice had formed a sort of gallery about 6 feet broad, close to the mountain wall. In this, after immense difficulty, we pitched our camp, all working calmly, although fully realizing the awkward position in which we were placed. On Monday night, the 23rd, the bay was completely free of ice, and was perfectly calm. I then sent Mr. Fougner and the Finn Savio towards Camp Ridley in the small collapsible boat, with emergency rations sufficient for a few days. Shortly afterwards heavy ice came drifting rapidly into the bay, and we became very anxious about them, while we were ourselves without any craft whatever to take us from our momentary place of refuge. For two days we remained in ignorance of Mr. Fougner's and Savio's fate; but on the 25th, in the evening, both appeared on a very steep ice slope, descending from the perpendicular wall of Victoria Land. By the help of a little axe and an

alpenstock they cut footholds in the ice, and came slowly towards us. I soon discovered that they were in a pretty weak condition, and while Mr. Bernacchi started to cook some warm food for them, I began to cut steps in the steep ice-slope to meet them. At night we were again all safe in our little camping-place. Our comrades had spent two days and nights under the shelter of the canvas boat, and thought that they had discovered a possible place for an ascent to the ridge of Victoria Land some 5000 feet above us. The first 500 feet would, however, involve great risk. On the 27th I decided to make the attempt. Following the route by which Mr. Fougner and Savio had descended, we were enabled to reach the place where these two had camped, and saw the place likely to offer the only chance of escape. It was a rough kind of groove in the perpendicular cliff of Victoria Land, partly covered with ice and



CAMP RIDLEY AFTER THE FIRST SNOWDRIFT.

snow. After a good meal of seal beef, we began our ascent. Cautiously and slowly we climbed upwards, while the lesser slope some 400 feet above seemed continually to recede from us. All the night through we continued to climb, while the cold increased as we got up in the heights. By the ridge we were enabled to proceed to Camp Ridley, where great anxiety had prevailed, as our friends knew no place where we could possibly have camped.

We could now catch sufficient fish for our meals, thus gaining a valuable accession to our food supplies, and the knowledge that fish are to be caught will materially benefit future expeditions. The Aurora Australis was seen very often on clear nights. During May and June tremendous gales blew from the south-east, the wind often carrying stones with it. Great screwing also went on in the ice in the bay. The reading of the meteorological observations was often

carried out with great difficulty, and on one occasion Mr. Evans got lost in crossing from the thermometer screen to the house. We searched for three hours before finding him, and he was finally brought to the camp in an exhausted condition. However, under the careful treatment of the doctor he soon recovered. During the gradual shortening of the days we experienced great depression, as if watching ourselves growing old. We were getting tired of each other's company, and began to know every line in each other's faces. Chess, cards, and draughts were the most popular recreations. On June 3 the thermometer showed -31° , and some of my staff had the extremities badly frozen. As it was the Duke of York's birthday, the Union Jack, his present to the expedition, was hoisted, whilst a beautiful Aurora waved in mighty curtains over Camp Ridley. On June 15 another tremendous gale was blowing, lasting until the 17th, and making it impossible to collect the meteorological readings. Had we not had the sloping safety roof towards the east, I doubt whether the houses would have remained on *terra firma*. As will be seen from our meteorological observations, a great and sudden rise of temperature indicated the approaching gale. The days were now very dark, though the horizon towards the north-west was slightly crimson. The darkness and the silence in this solitude weigh heavily on one's mind. The silence roars in one's ears. It is centuries of heaped-up solitude. During the last sledge expeditions depôts had been made at several places along the coast in Robertson bay, and on the peninsula, in more elevated places than the camp, in case high water should at times rise above its level.

On July 26 I started on a fresh sledge journey, with the object of reaching the coast to the west of Robertson bay. At twelve mid-day I started with Mr. Evans and both of the Finns, taking provisions for thirty days, and twenty-nine dogs. For 12 miles we had very rough travelling, owing to the large ice-blocks heaped one upon another. At 4 p.m. we pitched our camp at the foot of an iceberg. As the ice conditions to the southward appeared very promising, I decided to send Mr. Evans back to Camp Ridley to tell Mr. Colbeck and Mr. Fougner to follow with more sledges and provisions, while I started southward, accompanied by the two Finns. We travelled all night without pitching camp, with a temperature of -25° . During the next two days it was misty. No land was to be seen, and I could get no observations. Towards evening on the 28th a gale came on with heavy drift, and we all remained inside the tent in our sleeping-bags. It was bitterly cold, and we suffered greatly from frost-bites, while the dogs froze fast to the ice. No land could be sighted anywhere. On July 31, having seen nothing of the party which was to have followed us up, we proceeded onwards on comparatively good ice. In the evening I discovered an island towards the south, and reached the western side of it an hour after dark. We were then very hungry and worn, the temperature was

-40° when we pitched the tent. I called this camp Midwinter camp, and the island Duke of York island.* On August 2 I resolved to investigate some of the coast-line of this island. I took with me the Finn Must, while I left Savio in camp to construct a kind of Finn tent out of provision bags, sealskins, and bags, which he proposed stretching over our sledges pitched on one end. Must and I proceeded along the northern shore of Duke of York island, and reached a bay which I named Crescent bay. During the succeeding days I made as thorough an investigation of the immediate surroundings of our camp as the cold and weather permitted. As I was getting anxious about the party



DUGDALE GLACIER (MOUTH OF).

which was to have assisted us, I began to take in stores of seal-beef and blubber. We suffered a great deal from cold and frost-bites, although we managed to keep up a blubber fire in the tent. However, both of my brave comrades kept up their courage, and were always cheerful. Having secured a valuable geological collection, in the middle of August we started back, and on this journey we experienced the lowest temperature we recorded—it reached -52°, or 84° of frost.

On our return to Camp Ridley, I decided to continue the explorations already begun in Robertson bay; partly from the great geological and other interest presented by that locality, and partly

* 71° 35' S. lat., 170° 24' E. long.

because I hoped to find there a likely place whence to penetrate further inland. Expeditions were therefore despatched during the remainder of August and September under the different members of my staff in turn, and valuable collections and observations were made. In the vicinity of Robertson bay, the great elevation of the land, which reached far above 12,000 feet, rendered it difficult to find a likely place for a journey into the interior. Glaciers thousands of feet in height precipitated themselves into the sea, sometimes at an angle of about 50° , and, being crossed by innumerable deep crevasses, rendered our expeditions on the coast both arduous and dangerous. The Finn Savio and myself worked in the vicinity of Mount Sabine for more than seven weeks, camping in a hut constructed of stones between two projecting rocks. During the time we were camped there communication with Camp Ridley was continually kept up, and stores brought thence to form a *dépôt* at Duke of York island. While bringing supplies to the *dépôt*, Mr. Bernacchi and Mr. Ellefsen had a frightful experience, being overtaken on the ice-pack by a furious gale. During this time I visited land to the south-west of Duke of York island, forming part of the Admiralty range, which, as it is a land of intense geological interest, I named Geikie Land. Moraine studies were made here, while Duke of York island was thoroughly investigated. Its position, similar to that of Doubtful island, discovered by Sir James Clark Ross, illustrates that remarkable formation which, in the close vicinity of great glaciers, makes it so difficult to decide whether the land really is an island or joined to the mainland as a peninsula. Duke of York island is cut through from east to west by broad, deep quartz reefs. Suffice it to say that minerals of value occur in this vicinity, justifying the belief that in time to come exploration will receive much support from commerce. I took formal possession of the island for Sir George Newnes by the hoisting of our Union Jack. Geikie Land, which we visited on several occasions, is likewise rich in minerals. A good deal of vegetation was found there, but we experienced great difficulty in penetrating further inland. Sledges with provisions were taken up ridges, across glaciers, and down precipices; and when we could bring them no further we loaded ourselves, and with ropes and alpenstocks we climbed the steep slopes. Exhausted and frozen, we returned to our stone hut after numberless attacks on these inaccessible ranges.

The last report from camp told that Mr. Hanson was in a low condition and under medical treatment, having lost feeling in his legs, and being only able to walk with difficulty. The Finn and myself began to suffer severely from rheumatism, and Mr. Colbeck suffered too with neuralgia. On October 4 I started back for Camp Ridley with Mr. Fougner, and on arrival found Mr. Hanson's condition very low indeed. In spite of all the doctor's care and attention, he daily grew worse. At two o'clock in the night of October 14, the doctor called me in my

sleeping-bag, and informed me officially that Mr. Hanson had not long to live, that he had informed him of his condition, when he expressed a wish to say good-bye to us all. I found him quiet, and without pain. He calmly bade me farewell, and confided to me his last wishes, choosing himself the place where he wished to be buried—at the foot of a big boulder some thousand feet up Cape Adare. The next day, about three in the afternoon, he died without pain, keeping conscious up to the very last. Half an hour before he died the first penguin came back. Enthusiastic as he had always been in his calling, Mr. Hanson asked to see the bird, and was delighted to examine it. The doctor's official report says that he died from occlusion of the intestines. We buried him on October 20.

Penguins now arrived on the peninsula in great numbers, and we looked forward eagerly to the time when we might expect to get eggs. I continued during the remainder of October to send out expeditions in the vicinity of Robertson bay, all of them bringing back splendid collections, both biological and geological. Before the end of the month the ice-pack seemed to begin to slacken. I placed water-tight oaken casks both in the hollows of the icebergs and on the floes, enclosing a communication, in which I stated the results of the expedition, and requested the finder to forward it to the Royal Geographical Society, with details of the locality and circumstances under which it should be found.

On November 3 we got our first penguin eggs, which we devoured with eagerness. I at once ordered my staff to commence collecting eggs, which we put down in salt in case the vessel should not return, and we should be left for a longer time than we had expected. During the winter, both away from and in the main camp, we had lived chiefly on seal-beef; now penguin flesh and eggs formed a great resource. Mr. Fougner was now doing very valuable work for the marine biological department, numberless specimens of starfish and jelly-fish, as well as algæ, being added to our collections. The peninsula was now literally covered with penguins (*Eudyptes adeliæ*), and still a constant stream of new arrivals could be seen far out on the ice, like a long endless black snake winding in between the ice-floes. As no open water was to be seen anywhere, not even a vapour-cloud indicating the near neighbourhood of any, these welcome travellers must have had a long walk. With short interruptions we had continually experienced heavy gales, some of which exceeded 90 miles an hour. These gales naturally considerably checked the progress of sledge expeditions. Nearly all the provisions had to be taken with us, as little bird-life was seen except on the coast-line, and the frequent gales always necessitate a great percentage of idle camping days, when much of the provisions for the inland journey will be eaten without a corresponding advance being made.

According to our meteorological observations, no one ought, in my opinion, to start a sledge journey in these latitudes without taking into consideration the likelihood of getting at least 20 per cent. of checking gales. We have not here those aids which are found in the north, in the bears, foxes, musk-oxen, and reindeer of the Arctic fauna. Life depends entirely upon a careful selection of the necessary provisions, and nearly double the quantity necessary for the distance to be



STARFISH FOUND IN 20 FATHOMS AT CAPE ADARE (HALF NATURAL SIZE).

travelled must be taken, because of these powerful gales, in which it is not only impossible to travel, but difficult even to exist. These facts, besides the great elevation of Victoria Land and its difficult glaciers, make travelling within the antarctic circle quite a different matter to that in the arctic regions. In the vicinity of Cape Adare, a position which corresponds to that of Northern Norway, the ice and meteorological conditions cause much greater danger to the traveller than in those higher latitudes in the north which are ruled by similar average

temperatures. It seems as though an early break-up of the ice in the bay eastwards of the land stretching from Cape Adare down to the active volcanoes Erebus and Terror takes place every year, and occasionally I presume that the ice even breaks up for a week at a time in late autumn and early spring; thus travelling at sea in the pack, as well as in Robertson bay and in the vast Ross bay to the east, will always be perilous undertakings. In my opinion, successful exploration within the antarctic circle must always be confined to one locality, for if too large a field for operations were chosen, the natural conditions and the variable antarctic climate would make failure probable. Necessarily also there ought to be close co-operation between expeditions on land and at sea—between vessels and sledges.

These facts soon became evident to me as the season drew onwards. Up to the middle of November very little change was to be seen in the general ice-pack, although some open canals were met with on a sledge journey which the Finn Must and myself carried out to the east of Cape Adare. The canals closed again, and not until the end of November did noticeable changes take place in the ice-pack. Although the penguin colony seemed to fill the very ground of the peninsula, new arrivals continued even after the birds which arrived first had been sitting on their eggs for a fortnight. The skuas (*Lestris*) had by this time come back. The boldness of these birds is such that on several occasions I saw them attack the dogs, and nearly all of us were also attacked on more than one occasion. The *Pagodroma nivea* and the giant petrel also arrived, and we watched their movements with great interest to discover the places where they intended to nest. Our efforts were rewarded, and the extensive egg-collection which the expedition brings back is the result of sledge journeys to Duke of York island, to Geikie Land, and to the vicinity of Mount Adam and Mount Sabine.

After the middle of November dark vapour clouds were continually to be seen towards the eastern horizon, and on one occasion the temperature rose to $+18^{\circ}$. I went with the doctor towards the cape and found a large sheet of water, in which a strong current was running at a rate of from 5 to 6 knots. The ice was evidently wearing rapidly by this time, the current increasing perceptibly in strength from day to day. It seemed improbable that those abnormally violent gales would blow again before the autumn, the summer being so far advanced. As the bulk of the immense ice-pack still remained with very few interruptions, we began seriously to contemplate the possibility that the ice-conditions of the previous season had been exceptionally favourable, and that the *Southern Cross* might be unable to reach us. Strict precautions were therefore taken against using more than the necessary food, while we continually added to our provisions by seal-beef, penguins, and eggs. Clear, calm, comparatively warm days became now frequent. Mr.

Bernacchi and Lieut. Colbeck were now making the final arrangements for observations of the total eclipse which was to take place on December 3. However, our expectations were doomed to disappointment, the day proving overcast. Some interesting temperature records and time observations were, however, registered in connection with the eclipse. The ice now began to break up in earnest. It is clear that all the pack-ice must needs take a westerly course under the influence of the prevailing wind, and northerly under that of the current. It was therefore likely that my instructions to Captain Jensen not to go further west than 170° would cause the *Southern Cross* to reach open water at a comparatively early part of the antarctic summer.



PART OF THE MEDIAL MORAINES AT GEIKIE LAND.

On December 10 I started on my last sledge journey into Robertson bay, principally for the purpose of securing eggs of the different birds. On this journey a remarkable discovery was made by the doctor. I had sent him on a short expedition into Admiralty range for the purpose of collecting specimens of the vegetation on Geikie Land. When he came back, he was proud to show me several insects of three distinct types, which he had found in the mosses. This discovery is naturally very far-reaching. The existence of insects throws a satisfactory light on our meteorological work, and it is improbable that the temperatures about Geikie Land will fall much below those we had experienced, otherwise the life of insects would not be possible. It may be that we had experienced a comparatively cold winter. From Crescent bay, on

Duke of York island, we entered a bay to the south-east—an arm of Robertson bay—at the end of which I found a very low and easily accessible land, the beach rising from the water to the height of about 30 feet. The land was formed partly by the glacier, and partly through stone-shoots from the mountain side to the north-east. As a dividing line between this work of the glacier and that of the mountain ravines, a small stream came rippling down among the boulders and rocks from two small lakes, formed through the melting of the great glacier, which I named the Murray glacier. Before we returned to Camp Ridley, we explored this neighbourhood to the height of 1700 feet, at which height we found vegetation. When travelling back, we



REINDEER MOSS (LICHEN).

found that a good deal of water had accumulated near the coast-line and made the landing with sledges and gear difficult.

As I remarked in 1895, after my first antarctic journey, it must strike any one with an eye for geological science how the nature of Victoria Land speaks of evolution. One need only look at the moraines, the empty glacier beds, and the worn rocks of Victoria Land to be convinced that these lands must have changed during periods comparatively not very distant.

On the 27th the report from the top was to the effect that no ice was to be seen towards the north, even through the telescope. To the north-west and west much ice was, however, in view. Along the beaches of our peninsula the ice was getting unsafe for travelling. Several young penguins were out of their shells, and Mr. Evans, who had taken over Mr. Hanson's department, collected specimens of the

young ones from day to day in order to get the series in their growth. Mr. Fougner secured a magnificent specimen of a jelly-fish.

New Year's Day broke bright and clear, with the Union Jack flying merrily at the flag-staff, and we looked back with feelings of pardonable pride on the work accomplished by us during the year just sped. On January 5 there was open water as far as the eye could reach towards north and east. We swept the horizon, but no signs of the returning vessel were to be seen. Although there was open water everywhere, many huge icebergs were now seen to drift northwards past the cape. Some few seemed to be influenced by a strong under-current, which brought them into Robertson bay, where the larger ones ran aground. It was an interesting sight to witness these bergs sail into the bay straight against a heavy gale, and against the upper current. On January 23, the anniversary of my first landing on the antarctic continent in 1894, I found that the season in regard to climate and ice conditions were not so favourable as in that year. The young penguins were not so far advanced as then.

Early on the morning of January 28, the Finn Savio and I paddled back to Camp Ridley from a kayak expedition; and at 8.30 on that day Captain Jensen entered Camp Ridley with the mail from Europe, while the ice-covered masts and yards of the *Southern Cross* stood out sharply in the frosty air. Gradually we heard all the news, both private and public. Never had we realized more what a large part the daily newspaper plays in our life. We learnt for the first time about the war in the Transvaal, about the recent discoveries in telegraphy, and found how many changes one year might bring about. We were especially interested to hear of the active steps which had been taken to continue the prosecution of antarctic research. We at once began to take on board from Camp Ridley such stores as were wanted for our southward journey. The dogs, sledges, instruments, and fur were likewise brought on board; and after visiting Mr. Hanson's grave, we all embarked, leaving at Camp Ridley the huts, a quantity of coal which would have kept us for another year, a considerable amount of provisions, and a small note from myself to the commander of the next expedition. In the evening of February 2 we steamed away from Camp Ridley, and I had again the united expedition of thirty souls under my command.

Taking repeated bearings of Victoria Land for mapping purposes, we arrived at Possession island at 6 a.m. on February 3. Instruments and cameras were put into a boat, and I effected a successful landing with the whole of my staff. On Possession island we found the post with the iron box left there by the antarctic expedition of 1895. I left a letter in that box with the names of those who had landed with me, and after collecting specimens of rocks and vegetation, and securing as many photos as possible, we reached the vessel without mishap. On February 4 we had a fine day, each undulation and white peak of Victoria

Land standing out clearly defined against the blue sky. At Coulman island I again effected a landing, after which, principally on account of the magnetic observations which would be invaluable in this locality, the course of the *Southern Cross* was laid westwards. Since leaving Cape Adare the temperature of the water had risen from 28° to 30° . The land for some 40 miles inland appeared considerably lower than the ranges near Cape Adare, but in my opinion even here there would be no opportunity for a sledge party to proceed successfully far inland. However, having penetrated as far as possible towards the land to the west of Coulman island, and to the south of a conspicuous cape, which I named Cape Constance, after my wife, we found a bay in an ice barrier, or rather in the seaward edge of the ice-sheet, descending from Victoria Land. We found an admirable place for the magnetic observations, which were made on the ice by Mr. Bernacchi and Lieut. Colbeck, and which were of the greatest value for the location of the present position of the south magnetic pole. The dip taken here was $87^{\circ} 18'$. With the aid of sledges we reached the end of the bay, where we found very many seals. On leaving this locality on the 4th, we had considerable difficulty from drift-ice. On the 5th we steamed southwards, and saw a great deal of pack-ice towards the west, so the coast-line here could not be distinctly mapped for some distance. On the 6th we were in lat. $74^{\circ} 32'$. We sighted continuous land towards the west, and as little pack-ice was seen, I decided to risk an investigation of the fjord, to the north of the range which terminates in Cape Washington, as here also I hoped to be able to afford my magnetic observers the necessary opportunity. Proceeding westwards for about 20 miles from the cape, we discovered a promontory almost clear of ice and snow, with a beach of about 100 acres. There I effected a landing with the whole of my staff, including Captain Jensen, and two sailors. The promontory runs north-west, leaving a cove, apparently a splendid winter harbour, to the southward, where Mount Melbourne rises to a height of about 12,000 feet. Its conical volcanic top was distinctly reflected into the clear cove, and reminded me of Mount Etna; while the midnight sun surpassed itself in splendour. To the south-east the peninsula or promontory was undulating, and rose in wonderfully worn shapes to the height of about 700 feet, affording wild and magnificent scenery. Large pieces of brimstone and lava covered the ground. A sharply defined ice-line intervened between this dark peninsula and the foot of Mount Melbourne. Evidently this promontory was formed by a volcanic eruption of Mount Melbourne, the side of which, however, was covered with a thick sheet of ice and snow. We found vegetation here of two different kinds, very many skuas, plenty of seals, and a small penguin rookery.

On the 7th, at 8.30 a.m., we passed Cape Washington, the coast-line towards the south-west gradually appearing lower. Here and there dark conspicuous rocks protrude from enormous glaciers. At midnight on the

7th, Lieut. Colbeck and Mr. Bernacchi were again able to take a dip observation on the ice. Mount Melbourne could still be distinguished to the north-west through the misty air, while ahead of us Franklin island rapidly grew more distinct. At 5 p.m. we effected a landing on its western side, on a pebbly beach very like the peninsula at Cape Adare. There were very many penguins on the peninsula, many more than were left at Cape Adare when we last said farewell to Camp Ridley. The most interesting discovery, however, was made in the marine zoological department, Mr. Fougner securing a rich collection of the shallow-water fauna. On the 10th, at twelve o'clock noon, the *Southern Cross* was in $77^{\circ} 17'$ S. lat., and 168° E. long. We had, immediately towards the south, Mount Erebus and Mount Terror, some misty clouds hanging round their tops. The coast-line is ice-bound, with a barrier about 7 feet thick, and only here and there broken by a projecting rocky promontory. Cape Crozier is comparatively free from ice and snow. We secured photos of Mounts Erebus and Terror, the former volcano being in activity. I effected a landing at the foot of Mount Terror, taking with me Lieut. Colbeck, Captain Jensen, and two sailors. The beach was formed by *débris* from an overhanging rock about 500 feet above, and did not exceed 10 feet in width and about 4 feet in height.

Shortly after landing, Lieut. Colbeck, at my request, went back with the two sailors in the boat to fetch a camera, while Captain Jensen and I busied ourselves in collecting. Suddenly a tremendous roar commenced overhead. At the first moment the thought passed through my mind that the overhanging rock was coming down upon us. In the next I realized the dangerous fact, and communicated it to Captain Jensen, who simultaneously recognized that the glacier immediately to the west of our little beach was giving birth to an iceberg. Quick as thought the event followed. With a deafening roar a huge body of ice plunged into the sea, and a white cloud of water and snow hid everything from our view. There was absolutely nothing to be done, and we both foresaw what immediately afterwards followed. A tidal wave—if I so may term it, because of its similarity to such—a raging, rushing wave, rose like a wall from the plunge of this million-ton mass of ice. It seemed rapidly to grow as it hurried towards our low ledge. We instinctively rushed to the highest part of our beach and stood close to the perpendicular mountain wall. The wave, which must have had a height of from 15 to 20 feet, seemed long in reaching us. It struck me first; lumps of ice dashed against my back, and I clung to the rock until I felt that the blood rushed from beneath my nails. I had just time to call out to Captain Jensen to cling to the rock, when the icy water closed over my head. When it had passed Jensen was still at my side. The next few waves were several feet smaller, and only washed about us up to our arm-pits, but the drag of

the water when it returned from the cliff tried us almost beyond our strength. Had it not been for a projecting ice-slope, which seemed to break the wave in its advance, we should undoubtedly have been smashed against the rock; for where the wave, unchecked, hit the wall some 10 yards beyond us, it tore away stones and left a mark of moisture some 20 feet above our heads, while marks of spray were to be seen still further up. Far out at sea the boat was returning with Lieut. Colbeck and the two sailors: they saw all that had happened to greater advantage, and of course realized the full extent of the danger we were in, Lieut. Colbeck having saved his boat from being swamped



A TYPICAL ANTARCTIC ICEBERG.

only by the exercise of considerable presence of mind. As it was, both Captain Jensen and myself escaped with a good deal of knocking about, and of course wet to the skin and chilled by the icy bath; but a splendid collection of rocks and vegetation soon made us forget the incident, which might have ended disastrously for us.

I now decided to steam southwards. To the south-east Mount Terror runs into the ocean with a rather gentle slope, and this part, curiously enough, is free from ice and snow, though the cone is covered in a mail of ice. No evidence of activity was noticed in this volcano. The eastern quarter of the coast-line of Mount Terror is not ice-bound, but from the south-east cape a high continuous ice-barrier stretches to the east-south-east, apparently about 60 feet high. From the crater of Mount Erebus a smoke-cloud was from time to time shot up into the

frosty air. A very biting breeze from the south was blowing; the thermometer marked several degrees below zero, and the deck, rigging, and sides of the vessel were all covered with ice. We proceeded along the barrier, slowly gaining some southing. On the 12th we were in $78^{\circ} 4'$; the barrier was still unbroken, but it seemed now inclined to take a somewhat southerly bend. In the evening we must have been in about $78^{\circ} 10'$. On the 13th a strong gale, with heavy seas and thick snow-drift, commenced. The *Southern Cross* had several feet of ice on her decks, bulwarks, and sides, and crew and staff suffered severely from the cold. In the intervals between the thick snow squalls tremendous icebergs hove in sight. On the 14th the gale somewhat lessened. On the 16th we were still proceeding southwards, with plenty of pancake ice around us. On the 17th, while in lat. $78^{\circ} 34'$, and E. long. $195^{\circ} 50'$, I discovered a break in the barrier with low ice towards the east. At this place I effected a landing with sledges, dogs, provisions, and instruments; and leaving the vessel with the rest of the expedition in charge of Captain Jensen, I myself, accompanied by Lieut. Colbeck and the Finn Savio, proceeded southwards, reaching $78^{\circ} 50'$, the furthest south ever reached by man.

On the 19th the voyage towards civilization commenced. On March 30 the *Southern Cross* dropped her anchor at Stewart island, New Zealand, where fresh food was brought on board. Here I left the *Southern Cross*, with instructions to Captain Jensen to proceed to Hobart, while I gained the Bluff, New Zealand, in a small fore-and-aft schooner. We arrived there at midnight, and I was enabled to send the following communication to Sir George Newnes: "Object of expedition carried out. South magnetic pole located. Furthest south with sledge, record, $78^{\circ} 50'$. Zoologist Hanson dead. All well on board.—BORCHGREVINK."

APPENDIX.

PHYSICAL GEOGRAPHY AND GEOLOGY.

The general aspect of Victoria Land is that of a wide, elevated, mountainous country, with peaks rising to the height of between 10,000 and 12,000 feet above the sea-level, precipitating into the antarctic ocean innumerable broad glaciers, traversed by deep yawning crevasses, which present an almost insurmountable barrier to the progress of the traveller. It is remarkable how free from ice and snow Victoria Land is at places near the coast. Cape Adare, Duke of York island, Geikie Land, Doubtful island, Possession island, parts of Coulman island, Cape Constance, Newnes Land, Cape Crozier, and numerous places between these conspicuous antarctic landmarks, are all bare of ice, most of them producing vegetation in the summer. At Newnes Land a minor eruption at the side of Mount Melbourne may account to some extent for the hospitable appearance in this locality; but the presence of the penguin colony there in their old nests, and the vegetation, indicates that the place for a considerable time past has been undisturbed by the forces within Mount Melbourne. Gales of course sweep the snow

away from many places, but this cannot be the general explanation, for some of the features mentioned, especially the camping-ground at Newnes Land, are rather sheltered. The land seemed to get somewhat lower south of Newnes Land, although through the telescope immense peaks were discovered in a chain far inland; but pack-ice prevented us from pushing close up to the land between Cape Washington and Mount Erebus. However, I regard Newnes Land and the vicinity of Cape Neumayer and Cape Gauss as of special geographical interest, apart from the desirability of these places as magnetic stations. At Newnes Land a party ought to winter. We observed many fjords penetrating Victoria Land from the coast, especially in the vicinity of Newnes Land, where the inner part of Southern Cross fjord still remains to be explored. It, as well as Wood bay, was blocked by ice at the time of our visit, but I consider it a particularly suitable place for the establishment of a winter station.

The geological and mineralogical specimens collected are to a great extent a more complete series of the rocks which I secured at Victoria Land in 1894. Most of the rocks are of volcanic origin, and represent basaltic lava-flows which have taken place during late geological epochs. The specimens I brought from the South Victoria continent differ but little from those I found on Possession island, but distinctly new features are to be found in Duke of York island and in Franklin island. I also collected this time a rock with indistinct granular structure which much resembles the garnet sandstone of Broken hill. The particular specimen is composed of quartz, garnet, and felspar fragments. On Duke of York island broad quartz reefs are to be found; but a complete report upon the geological and mineralogical conditions of South Victoria Land can of course only be made when microscopical and chemical tests have been applied. The moraine studies will, I think, prove of considerable value, both in regard to the geological formations near the coast and to the movement of the glaciers.

ICE CONDITIONS.

The antarctic icebergs are in appearance of two distinct kinds, although, in my opinion, they have a similar origin. They are either discharged from what is ordinarily understood as glacier, or broken from the big barrier in the extreme south. However, to my mind, this barrier is merely the northern extremity of a great ice-sheet sloping northwards from land near the South pole, which is really nothing more or less than an immense glacier. The bergs discharged from a glacier, which has descended from a great elevation and been squeezed between immense peaks, will naturally have a more rugged appearance than those discharged from the gently sloping ice-sheet. The former are often overturned when forced into the sea, the latter break gently off through the great but steady pressure of the ice-sheet; and the iceberg will, even after the calving has taken place, maintain the character of the barrier or ice-sheet from which it was derived. The uppermost part of the bergs broken from the barrier is generally formed by a horizontal layer, from 30 to 40 feet thick, of ice due to snow-fall, which, under the pressure of the wind, has quickly taken the nature of ice, but remains easily distinguishable, by its white colour and soft structure, from that of the under part, the clear green and blue stratified glacier ice. Under the influence of the prevailing under-current these monarchs moved north-eastwards. The pack shows distinctly two kinds of ice, with different origins: on the one hand, that which is formed by the freezing of the sea; and on the other, the smaller ice broken from glaciers or from the extremity of the ice-sheet in the south. The difference between the two is not always so marked as to be distinguished without careful observation, the pressure and screw in the sea-ice near the coast of the

antarctic continent being so great that the blocks are reared on end, and would, to a casual observer, appear like glacier ice; but a nearer investigation will show two distinct structures. It is the land ice, or glacier ice, in the pack which, being harder and more angular, is most dangerous for ice navigation. The general movement of the antarctic ice-pack is apparently north-easterly, this direction being determined both by current and wind. The open water to the east of Victoria Land is undoubtedly due to the heavy south-easterly gales, as also to currents setting east of Victoria Land, and to the comparatively warm water in that locality. Active volcanoes above and below the sea-level probably play a considerable part in altering ice conditions. In travelling towards my furthest south on the southern ice-sheet, I noticed that here and there the surface rose in small cones, which at places were broken into rough walls of about 30 feet. Sometimes the ice-sheet suddenly took a terrace form, but this was always local, and the general nature of the surface was that of an immense white unbroken flat, with a scarcely noticeable rise towards the south. With a sufficient number of reindeer, sledges, and dogs, and a very small party of scientific men, I believe that a high southern latitude may be reached on this ice-sheet in the proper longitude.

A vessel bound for Victoria Land ought not, without special reason, to proceed west of 170° long. E. November and December is, I believe, the best time at which to approach the ice-pack. A general break-up of the ice does not take place before the end of January, and I do not think that under normal conditions a vessel would succeed in reaching Victoria Land much before the beginning of February. I regard the success of Sir James Clark Ross, without the help of steam, unquestionably as a sign of exceptionally favourable ice conditions in the year when the *Erebus* and the *Terror* penetrated into the antarctic ice-pack. In ice-pack similar to that encountered by the *Southern Cross*, sailing vessels would be entirely helpless and at the mercy of the pack. The progress of a vessel in the antarctic pack depends, according to my experience, very much upon the locality in which the pack is attacked, and also on the meteorological conditions. In the absence of land to the north, the big swell of the south-westerly trades reaches the antarctic pack, causing great pressure, under which a very heavy screw takes place and threatens to crush the staunchest of vessels, while sledge journeys become at times impossible. It also happens that even after the ice is 2 or 3 feet thick, a gale of 100 miles an hour begins to blow, and the ice which may have been absolutely safe for travelling one hour, has the next been ground up into furious rolling waves. In Robertson bay the ice did not attain a thickness of more than 5 feet, and at places it was only 2 feet thick throughout the winter. I believe this to be greatly due to the strong currents which prevailed in and near Robertson bay.

ZOOLOGY.

Birds.—The common penguin of Victoria Land is the *Eudyptes adeliae*. As in 1894, the rookery of these birds at Cape Adare covered the whole peninsula of Camp Ridley, their nests, placed above the guano deposits, being formed of small pebbles, probably blown from the top of the cape by the gales. In 1894, the colony was inhabited almost entirely by white-throated penguins, whereas those met with on our outward voyage in 1899 had nearly all black throats. I was able to prove that both are of the same species, the young birds, which are left behind when the old ones go to sea, having more or less white throats. It was curious to see the penguins as they invaded the peninsula in the spring, one continual stream passing over the ice from October 14 onwards. They at once started nest-making, taking possession of their old places, and bringing new pebbles to the nest. During the time of love-making they had many hard fights. As a general rule two eggs are

laid, but very seldom three are found in one nest; the period of incubation, during which both birds take their turn in the nest, lasted in 1899 from the beginning of November to early in December. During heavy gales, the birds, which ordinarily sit upright or lie facing various directions, all turned with their beaks to the south-east, the direction from which we had the heaviest gales. The skua is the worst enemy of the penguin, constantly soaring over the nests and watching an opportunity to steal an egg or young bird.

We saw comparatively few of the emperor penguin (*Aptenodytes forsteri*), nor were we able to find their nesting-place. In the autumn of 1900, we for the first time saw several together, and even then only in small numbers. They came swimming like the small penguins, with which, however, they did not mix.

No specimens of the king penguin (*A. pennanti*) were seen.

The skuas (*Lestris*) arrived somewhat later than the penguins, and their eggs were also laid later. They made their nests in the heights, up to 1000 feet on Cape Adare.

Of petrels, the *Oceanites oceanicus* also hatched on Victoria Land, the nests being found in cracks of the rocks and under boulders. The elegant white petrel (*Pagodroma nivea*), with black eyes, beak, and feet, likewise builds in cavities of the rocks. These birds are attractive both in appearance and habits. The pairs show deep attachment, and the courage of the male is indomitable when his mate is in danger. The brown-backed and giant petrels were seen, but their nests were not discovered. I believe the former nest on Geikie Land. The giant petrels seemed to arrive before the approach of gales, and I attributed their visits to strong gales at sea, which drove them towards the shore for shelter. In their flight they much resemble the albatross.

Seals.—The seals we encountered in the pack on the southward voyage were, as they always have been found in the antarctic regions, scarce, all of them being hair-seals. Besides the sea-leopard, Weddell's seal was the best represented. We found the characteristic white seal of the antarctic in greater numbers than in 1894; and Mr. Hanson made, at my special request, as good a study of this interesting species as time, specimens, and opportunity allowed. As we proceeded southwards, the number of seals basking together increased considerably, and in the vicinity of Coulman island and Cape Constance, in Lady Newnes bay, we saw as many as 300 together. These were Weddell's seal. The new species of seal discovered by Mr. Hanson in the pack was very poorly represented, and we only secured four specimens of them altogether. These were three males and one female. In the vicinity of Cape Adare seals were to be found nearly all the winter; either on the ice near their blow-holes, or in the water at these holes, which they managed to keep open in Robertson bay nearly all the winter. I had hoped to have found that the white seal would breed in Robertson bay, but was disappointed at finding that this was not the case. The Weddell's seal and sea-leopard both bred in Robertson bay, and we frequently found the young ones on the sledge journeys. The seals, like the penguins, provided us with fresh food.

The Shallow-water Fauna.—In Robertson bay there is an abundance of fish, and in all we discovered about five different kinds. One particular species was often over 12 inches in length. The most remarkable form was a fish about 9 to 10 inches long, with a body much like that of the jack, with a very long under-jaw reaching beyond the upper, and armed with two very sharp, comparatively long teeth inclined backwards. The head occupies nearly one-third of the entire length of the fish. It is a greenish-grey colour above, and lighter underneath. Another remarkable fish is absolutely white. It has much the shape of a herring. Of lower organisms, caught principally by the dredge, medusæ were well

represented. One large jelly-fish was caught near the peninsula with arms about 12 yards long. Its weight was 90 lbs. Smaller jelly-fish, several kinds of star-fish, shells, sponges, and a variety of shrimps and crustacea were secured. All along the coast as far as Franklin island a very fine coral was found.

Insects.—Perhaps the most remarkable biological discovery is the finding of insects of three distinct types. They were found in the lichen. Although very minute they are easily distinguished by the naked eye as they move about in the lichen. Their presence naturally indicates an average temperature in the locality in which we found them, not varying greatly from that observed by us.

VEGETATION.

Besides abundance of the lichen which I discovered in 1894, we now found five different kinds of lichen, including the ordinary reindeer moss. Specimens were obtained as high up as 3000 feet, and as far south as 78°, at the foot of Mount Terror. On the coast, from Cape Adare onwards, seaweed of many different kinds was found in large quantities.

METEOROLOGY.

The following is an outline of the meteorological and magnetic observations taken by the expedition in southern latitudes. The observations being still unreduced, it is impossible to discuss them fully at present, and for this reason no readings of the barometer can be given in this report. These meteorological observations were taken at Cape Adare in lat. 71° 18' S., during an entire year, from February, 1899, to February, 1900. They were conducted on nearly the same lines as at a station of the first order, and as accurately and regularly as possible. During nine months of the year readings were taken two-hourly, from 9 a.m. to 9 p.m.; and during the three winter months, June, July, and August, two-hourly observations were made day and night. Besides these readings, and those of maximum and minimum thermometers, the self-registering instruments furnished barograph and thermograph curves for the whole period, and records of the amount of sunshine were made by the Campbell-Stokes sunshine recorder. The tables given below, although only first approximations, are sufficiently exact to indicate the general nature of the climate. Observations taken at Cape Adare are possibly affected to a certain degree by local accidents, such as the contour of the country and proximity to the sea; but the record for the year has the great advantage of being taken at one spot.

Meteorological observations were taken on board ship every two hours, night and day, during the month (January, 1899) she was beset in the ice-pack. The geographical area over which the observations were taken was between the parallels of 63° 38' S. and 66° 46' S., and the meridians of 160° 6' E., and 166° 56' E.

The mean temperature of the air for January was 29°·94 Fahr., and of the sea 29°·64 Fahr.; the mean temperature for the second week being the highest in both cases, as is shown by the following table:—

TABLE I.—*Weekly Mean Temperatures for January, 1899.*

				Mean temperature of air.	Mean temperature of sea.
				° F.	° F.
First week	...	...	...	30·2	29·8
Second week	...	...	...	31·9	30·1
Third week	...	...	...	29·4	29·5
Fourth week	...	...	...	28·4	23·2

The lowest temperature of the month, which occurred on the 29th, at 3 a.m., was $16^{\circ}8$ Fahr. ($-8^{\circ}8$ C.) in lat. $66^{\circ}45'$, and long. $165^{\circ}25'$ E., off one of the Balleny islands. The highest temperature for the month was $36^{\circ}4$ at 5 p.m. on the 12th, lat. $65^{\circ}3'$, and long. $161^{\circ}42'$ E. The mean diurnal oscillation of temperature for the month was $5^{\circ}20$ Fahr. The greatest range between the maximum and the minimum of one day was 16° Fahr., the least 1° Fahr.

Light and variable winds prevailed during most of the month; the force was rarely greater than 4, Beaufort's scale. Gales blew on the 9th, 16th, 22nd, and 23rd, when the velocity of the wind exceeded 30 miles an hour. The weather may be summarized as 5 days' clear bright sunshine; 13 days' snow and sleet; 2 days' rain, when the temperature rose above 32° ; 4 days' mists and fogs; and the rest overcast.

As will be seen from the table given below, the mean temperature at Cape Adare is above zero for six months in the year, and for six months below zero.

TABLE II.—*Monthly Mean Temperatures.**

Month.	Mean temperature.	Date of maximum.	Maximum.	Date of minimum.	Minimum.	Range.
	$^{\circ}$ F.		$^{\circ}$ F.		$^{\circ}$ F.	$^{\circ}$ F.
1899.						
February	$26^{\circ}4$ †	—	—	—	—	—
March	17.7	5th	31.1	25th	- 2.5	33.6
April	10.3	2nd	30.0	19th	- 10.0	40.0
May	- 4.6	4th	23.2	13th	- 31.1	54.3
June	- 11.8	11th	14.1	3rd	- 36.0	50.1
July	- 8.6	18th	23.8	9th	- 39.9	63.7
August	- 13.4	15th	18.9	4th	- 43.1	62.0
September	- 11.9	7th	11.5	30th	- 36.1	47.6
October	- 1.8	15th	19.6	2nd	- 35.5	55.1
November	+ 17.8	28 h	45.7	1st	- 4.0	49.7
December	31.8	25th	42.2	11th	+ 20.4	21.8
1900.						
January	33.0	23rd	48.9	10th	22.5	26.4

Mean temperature for the year = $7^{\circ}05$ Fahr.

August was the coldest month, the mean temperature being $-13^{\circ}4$ Fahr. ($-25^{\circ}2$ C.). The extreme minimum temperature occurred on August 4, at 9 p.m., during perfectly calm and clear weather. Table 3 shows the fall of temperature during the afternoon of that day, with the accompanying barometric pressure:—

TABLE III.

Time.	Temperature.	Temperature.	Barometer (Corr.).
	$^{\circ}$ F.	$^{\circ}$ C.	Inches.
1 p.m.	- 36.0	- 37.8	29.292
3 "	- 40.0	- 40.0	29.312
5 "	- 41.5	- 40.8	29.324
7 "	- 42.0	- 41.1	29.344
9 "	- 43.1	- 41.7	29.355

At these temperatures the mercury froze in the ordinary thermometers, and spirit ones had to be used. The above temperatures are means derived from three

* Obtained by taking the means of maximum and minimum daily temperatures.

† Based on twelve days' observations, 16th to 28th.

thermometers. At these low temperatures there was a slight diversity in the indications of the respective thermometers, even after applying the corrections as given upon the Kew certificates. The maximum temperature observed at Cape Adare, $48^{\circ}\cdot9$ Fahr., occurred during a very heavy storm from the east-south-east, on January 23, 1900; but this is quite exceptional. The mean monthly temperature is above freezing-point during one month of the year, viz. January.

The relatively high mean temperature for July is due to the number of gales from east-south-east and south-east during that month, the temperature invariably rising with these winds. The extreme range of temperature was 92° Fahr., and the mean temperature for the year $+7^{\circ}\cdot056$ Fahr. ($-13^{\circ}\cdot9$ C.), which, compared to the mean annual temperature for the same northern latitude, is extremely low. The mean temperature for Lapland, in 71° N., is about 32° Fahr., and the mean temperature for the north of Spitsbergen, which extends as far north as 82° N., is about 10° Fahr.

The temperature of the sea during the greater part of the year, that is, while the surface of the sea was frozen over, remained constant at $27^{\circ}\cdot8$ Fahr. In the summer months, December, January, and February, it rarely rose above 32° Fahr.

During the winter months, or at least during the seventy-one days that the sun remained constantly below the horizon, the diurnal variations of the thermometer and barometer were scarcely perceptible, being almost, if not quite, concealed by the oscillations due to the passage of storms.

The intensity of solar radiation was measured with the black-bulb thermometer *in vacuo*. This instrument was freely exposed to the sun by fixing it horizontally above the ground at the same height as the thermometer screen, viz. 4 feet 6 inches.

A temperature above 80° Fahr. was frequently recorded by this thermometer, whilst the temperature in the shade remained below freezing-point. These high readings were probably due to the hygrometric conditions of the atmosphere, the air, on account of the intense cold, being extremely dry.

Table IV. gives some of the highest readings with the solar radiation thermometer and the temperature of air in the shade observed at the same time.

TABLE IV.

Date.	Solar thermometer.	Temperature in shade.
	$^{\circ}$ F.	$^{\circ}$ F.
March 3	88.0	24.0
" 6	92.0	22.4
" 14	88.3	20.9
" 16	92.2	24.5
" 26	104.2	8.0

Relative humidity between 40 and 50 per cent.

The most remarkable feature in the meteorological conditions of the antarctic is the wind. The prevailing east-south-east and south-east winds at Cape Adare, which is within the area of abnormally low pressure, tend to prove the existence of a great anti-cyclone stretching over the polar area, which in its turn necessarily implies the existence of upper currents from the northward, blowing towards and in upon the polar regions to make good the drain caused by the surface outblowing south-easterly winds. The frequency and force of these gales, and the persistency with which they blew—always from the same direction, east-south-east—the invariably high rise in the temperature, and the sudden fall and rise of the barometer,

the dryness of the winds—the relative humidity generally between 40 and 50 per cent.—and the motion of the upper clouds from the north-west, point to the fact that the south pole is covered by what may be regarded practically as a great permanent anti-cyclone, more extensive in the winter months than in the summer. Nothing more appalling than these frightful winds, accompanied by tons of drift-snow from the mountains above, can be imagined. On ninety-two days, or 26 per cent. of the time spent at Cape Adare, the wind blew from the east-south-east and south-east with a velocity above 40 miles an hour, and on one or two occasions above 90 miles an hour, at which stage our Robinson anemometers were demolished. A proper table of wind directions, velocities, and thermal windroses is not available, but the following tables will suffice to convey some idea of the conditions.

TABLE V.—*Number of Days in each Month when Velocity of the Wind was above 40 Miles an Hour.*

Month. 1899.	Number of days.				
February	5
March	11
April	8
May	7
June	7
July	12
August	6
September	6
October	7
November	5
December	9
1900.					
January	9

TABLE VI.—*Conditions during a Storm on April 2, 1899.*

Time.	Barometer (corrected).	Temperature of air.	Direction of wind.	Velocity of wind.
April 1—	Inches.	° F.		Miles per hour.
9 p.m.	29.599	12.2	W.	5.7
April 2—				
9 a.m.	29.199	17.0	Whirlwinds	—
11 a.m.	29.064	22.6	E.S.E.	82
1 p.m.	28.919	24.0	E.S.E.	83
3 p.m.	28.916	26.9	E.S.E.	102?
5 p.m.	28.880	24.3	E.S.E.	88
7 p.m.	28.880	25.3	E.S.E.	90
9 p.m.	28.917	27.9	E.S.E.	82.5
April 3—				
9 a.m.	29.208	19.5	S.	40.6

The maximum temperature during the gale was 31.5° Fahr. During a gale on March 19 a Robinson anemometer was demolished, the velocity of the wind exceeding 90 miles an hour; and another was destroyed on the night of May 18, when it was impossible to estimate the velocity of the wind. The anemometers used were tested at the Kew Observatory prior to the departure of the expedition from England, and were found to give results within 97 per cent. of the Kew instruments. It is evident, however, that the action of wear and tear on the instrument by these gales must have a very material influence on its indications.

The barograph and thermograph curves during a storm from the east-south-east on May 14, 1899, show very clearly that the temperature commences to rise before the barometer commences to fall; indeed, it was often possible to predict an approaching gale by the thermometer alone, long before the barometer showed any sign of the disturbance.

The mean barometric pressure for the winter months is much lower than the mean for the summer, but the means have not yet been determined. The highest barometric pressure occurred on July 22, 1899, when the barometer registered 30.182 inches, and the lowest, 27.860 inches, on September 9, 1899.

On the journey from Cape Adare southwards, some remarkably low temperatures were observed for the time of the year. Thus, off Mount Erebus on February 11, 1900, the temperature sank to -6° Fahr. with a wind from the south straight off the great ice barrier. Again, on February 19, the minimum temperature was -12° Fahr. ($-24^{\circ}4$ C.) with clear sky and light wind from the south. It is possible to form an idea from these temperatures what one would be likely to encounter in the way of cold on a sledge journey southwards from the edge of the great ice barrier in the middle of the antarctic summer.

MAGNETISM.

Magnetic observations taken in the vicinity of the south magnetic poles will always present great difficulties, unless taken on board ship at some distance from the coast-line, and with instruments of the nature of the Fox circle. The highly magnetic character of the rocks of the shores of Victoria Land not only renders the taking of magnetic observations extremely difficult, but the observations are themselves untrustworthy. Even far inland, where the ice-cap is some thousands of feet thick, the influence of the rocks, if magnetic, as is most probable, would certainly be felt. Under such circumstances, the unifilar magnetometer is the worst instrument that could possibly be taken to the antarctic regions for the determination of intensity. Besides being a most delicate instrument, and therefore difficult for transport across ice, it is heavy, inconvenient to manage in a cold climate, and most sensitive to any form of disturbance. The ordinary dip circle, fitted with Lloyd needles for the observation of total intensity, would possibly be the best instrument to use for isolated observations on shore; whilst differential instruments fitted up in a small house built expressly for the purpose, and erected in Wood bay, would doubtless be of considerable value, although the erection of the instruments would involve much trouble. A detailed magnetic survey of Victoria Land would, of course, be of immense value—of infinitely greater value than the determination of the spot where the needle stands vertical. In order to make such a survey, it would be necessary to take a number of observations surrounding the magnetic pole. The work would have to be done during the summer months by careful and determined observers, who must be fully prepared to meet with innumerable difficulties, and be physically capable of wrestling with them.

The magnetic observations taken at Cape Adare during 1899-1900 involved the three elements, declination, inclination, and intensity, and were conducted in an open Lapp tent with great personal inconvenience, sometimes even at a temperature of -25° C. This tent was situated at a distance of about 2000 yards from the base of a volcanic and highly magnetic range of mountains, which undoubtedly had considerable influence upon the magnets. The disturbances due to the occurrence of the aurora were also very great, so that very few of the observations taken with the unifilar magnetometer are entirely free from its influence. On account of the weak

horizontal intensity in the deflection observations for the moment of the vibrating magnet, distances 39 cms. and 52 cms. had to be used instead of 30 cms. and 40 cms., and as we had no correction to our deflexion bar for these distances, it was not possible to reduce the observations on the spot. In the vibration observations, every third transit was observed instead of every fifth, and in many cases it was impossible to observe torsion of the suspension thread on account of the agitation of the magnet. The horizontal force derived from a single observation taken on May 11, 1899, assuming errors at 39 cms. and 52 cms. to be the same as at 40, was 0.04086 C.G.S., dip at the same time being $-86^{\circ} 35' 20''$ and declination $55^{\circ} 46' 55''$ E. at 5.30 p.m.

The mean of some forty dip observations taken at Cape Adare gives $-86^{\circ} 34' 13''$, while the mean of some eighty declinations gives $56^{\circ} 2' 0''$ E. The diurnal variations of the magnetic conditions at Cape Adare appear to be very great, but the sudden and relatively large disturbances make the determination of the normal daily variations a difficult matter. Although it is not possible to eliminate errors due to the influence of magnetic rocks, one may presume them to be constant.

On April 10, 1899, the declination was observed every twenty minutes right through the twenty-four hours. The maximum declination occurred at 4.5 a.m., and the minimum at a little after noon, the difference between maximum and minimum being $3^{\circ} 2' 5''$. Again, on January 2, 1900, declination was observed every fifteen minutes. The maximum occurred at 6 p.m., and the minimum a little after noon; the difference between maximum and minimum being $1^{\circ} 38' 10''$. The change in declination takes place in long oscillations or system of pulls from fifteen to twenty scale-divisions to right and left of the centre, the interval of time being rather irregular. In order to give an idea of a disturbance, the following is an extract from the Magnetic Journal:—

"November 29, 1899.—Impossible to take set of magnetic observations, on account of the extraordinarily disturbed state of the magnets. Vibration magnet drawn as much as twenty and thirty on each side of the central division, and the whole scale would disappear from the field of view. At 4.10 p.m. the circle reading for declination was $157^{\circ} 44' 50''$; at 4.17 it was $156^{\circ} 32' 30''$, the magnet being in the same position (erect) for both readings. Thus there is a difference of $1^{\circ} 12' 20''$ in the declination for an interval of 7 minutes. The utter impossibility of taking observations under such conditions is obvious."

TABLE VII.—*Magnetic Dip at Eight Geographical Positions.*

Date.	Latitude.	Longitude.	Dip.	Remarks.
1899.	° ' "	° ' "	° ' "	
January 2 ...	63 41 S.	160 16 E.	-83 18 53	Taken in the ice-pack.
" 3 ...	63 40 "	160 36 "	-83 7 41	
March to Feb.	71 18 "	170 9 "	-86 34 13	Mean of 40 (Cape Adare).
1900.				
February 4 ...	73 17 "	168 31 "	-87 18 28	14 miles due west of Colman island.
" 6 ...	74 23 "	164 3 "	-88 1 31	Taken at foot of Mount Melbourne.
" 8 ...	75 18 "	163 32 "	-87 47 15	Taken on the ice-barrier.
" 8 ...	75 42 "	163 29 "	-87 34 51	" "
" 9 ...	76 12 "	168 20 "	-86 52 13	On Franklin island, west side.

Sir James Clarke Ross, in 1841, observed a dip of $-88^{\circ} 24'$ some 12 miles to the north of Franklin island, so that the decrease in fifty-nine years amounts to $1^{\circ} 32'$, or an annual decrease of $1'.56$. There is very little doubt that the magnetic pole is much further north and west than in 1841.

THE AURORA AUSTRALIS OR POLARIS.

The aurora, as is well known, is a phenomenon at the same time cosmic and terrestrial, which on the one hand is confined within the atmosphere of our globe, and stands in close connection with terrestrial magnetism, and on the other hand is dependent on certain changes in the envelope of the sun, the nature of which is as yet little known. At Cape Adare, which is probably within the circle of greatest aurora intensity in the southern hemisphere, particularly favourable opportunities are afforded for its study. During the cold months the atmospheric conditions are most favourable, the amount of cloud being small. During the winter the phenomenon was observed nearly every night, so it was possible to establish the diurnal period, for it usually manifested itself between 6 p.m. and 3 a.m., its maximum intensity being generally reached between 8 and 9 p.m. Of course there were exceptional cases. The intensity also appears to be much greater at the time of the equinoxes than during the mid-winter months, the displays being more brilliant and more rapid in motion at the former time. At Cape Adare (lat. $71^{\circ} 18'$) the aurora was always observed in the north, never in the south, and it always manifested itself in exactly the same manner. Diffused aurora light would first appear in the north about 3° above the horizon; soon afterwards a gigantic luminous arc would form above the diffused aurora, the extremities resting on the horizon, while the apex was situated a little to the west of the magnetic meridian.

The luminous arc generally formed the starting-point for the radiant draperies of rays, of variegated colours and with indescribably beautiful and graceful folds, which moved laterally and most rapidly from east to west, and bodily towards the zenith. Long shafts of light would shoot down towards the earth with incredible rapidity, the colour being of a much deeper red at the lower part of these shafts than at the upper. The intensity of the colour appears to have some connection with the altitude of the phenomenon, varying greatly with the density of the atmosphere. In other words, the colour of the aurora beams is an indication of its height above the surface of the earth, being deep red at a low altitude, and of a pale nebulous whiteness at great altitudes. But what was of greatest interest in the observation of the aurora was the connection which appeared to exist between it and an approaching atmospheric disturbance. A strong gale from the south-east was almost invariably preceded by a most brilliant and rapid aurora display. This was not a mere coincidence, but a fact repeatedly observed. It was also possible to predict an approaching storm many hours beforehand by the extreme agitation of the magnetic needle, both possibly being manifestations of the same cause.

As mentioned before, the immense influence of the aurora upon the magnetic needle made the taking of magnetic observations extremely difficult. In order to form an idea of the extent of these disturbances, the table on the following page is given, showing the relative position of the aurora in the sky observed simultaneously during an aurora display of very weak intensity.

During the appearance of the aurora the disturbance of the magnet lasted more than one hour. At no time was it brilliant or rapid in its movement. It was of quite an ordinary type as seen nearly every night. When it moved towards the west the disturbance appeared to be greatest. At times the aurora was fairly strong, but concentrated near the magnetic north. The needle was but little disturbed when the aurora became diffused.

May 31, 1900.—

Astronomical time.	Temperature. C.	Scale- div.	Value in arc.	Remarks.
H. M.	°			
6 45	-8.3	40.0	80.0	Magnet in meridian and steady. At 6.50 diffused aurora in north.
7 0	-7.8	47.5	95.0	Aurora becoming brighter, magnet oscil- lating between 47 and 48.
7 7	—	52.0	104.0	Beam of aurora shot up towards zenith, and magnet moved to 52.
7 10	—	53.8	107.6	Aurora becoming much brighter in mag- netic north.
7 12	—	56.0	112.0	Beam shot up from arc towards zenith.
7 15	—	57.5	115.0	Aurora arc from north by east to west (magnetic).
7 18	-8.0	58.0	116.0	Aurora stronger, curtain of aurora with slow motion.
7 22	-8.0	52.0	104.0	Arc and curtain in north and north-west becoming faint.
7 25	-8.7	55.0	110.0	Aurora arc becoming stronger in north- west.
7 27	-9.1	50.0	100.0	Aurora faded away in west.
7 30	-9.8	47.0	94.0	Becoming diffused.
8 0	-8.8	42.0	84.0	No sign of any aurora.

The following are extracts from the Meteorological Journal :—

May 6, 1889.—Very fine Aurora Australis first visible at 6 p.m. in the form of an arc of light in the north. The centre of the arc was about 3° above horizon, and bore about north by east. The arc was of large radius, the inner side or base being of much greater intensity than the outer; much yellow and red in the base part. Curtains of vertical beams of light, always parallel to the original arc, commenced to move slowly and bodily towards the south. The lateral movement was very rapid, and always east and west, and the bottom part of the beams denser and redder than the top. The curtains of light advanced no farther than about 15° north of the zenith, the limit in the east being the planet Jupiter and in the west the star Sirius. As the curtain of light moved south, the original arc became diffused but stationary, and had little movement. The display reached its greatest intensity at about 6.30 p.m. and ended at 7 p.m. A kind of diffused after-glow remained in the north for many hours. Temperature of air = 12° Fahr; barometer, 29.262 inches.

August 4, 1899.—An aurora was observed at a little before 6 p.m. in the form of a double luminous arc in the north. The arcs were separated from one another by about 2°, the inner one being about 8° above the horizon. The west extremity of the arc bore about north-north-west. The east extremity was invisible, being hidden behind the cape. The arcs lay in the same plane, and had a common centre. Winding curtains of aurora afterwards manifested themselves in the usual way, moving towards the zenith and forming coronæ there. Temperature of air = 41.5° Fahr; barometer, 29.200 inches.

Before the reading of the paper, the PRESIDENT said: At the International Geographical Congress in 1895, I had the pleasure of welcoming Mr. Borchgrevink on his return from his first voyage to the antarctic regions. From that time until Sir George Newnes undertook to send out an expedition under Mr. Borchgrevink, he worked incessantly—I will not say obstinately, but untiringly—to get an

expedition sent out under his command, and he succeeded. Last year we all thought of him and his gallant companions who were trying a great experiment, for they were the first men who ever wintered on land within the antarctic circle. In speaking of them then, we expressed our warmest sympathy for the zeal and determination they had shown in facing so many hardships and dangers in the cause of science. It must have been a relief to Sir George Newnes, who had undertaken a great responsibility, when he received a telegram to tell him that Mr. Borchgrevink and his companions had finished their work, and that they were safe. We all rejoiced, and are glad to welcome Mr. Borchgrevink here this evening, after having done his very best to secure the results for which the expedition went out, and with a large measure of success. I now request Mr. Borchgrevink to address the meeting.

After the reading of the paper, the following discussion took place:—

Captain CREAK: I should like to ask one question, as I hear the expedition located the south magnetic pole. According to our present knowledge, the magnetic pole is 400 miles from where Mr. Borchgrevink wintered, as determined by the observations of Sir James Ross in 1840-45. Prof. Gauss, in 1840, by calculation, located it about 100 miles from that position. I should like to ask Mr. Borchgrevink where he places the pole now. From investigations resulting from the *Challenger* Expedition, we have been shaken in the idea that the magnetic pole moves round the geographical pole; we have begun to doubt it, and it is almost impossible that the magnetic pole, as placed from Sir James Ross's observations and others, can have travelled 400 miles in forty years. This pole is an area, not a point, and the only possible means of fixing it is as magneticians have agreed—to observe at points surrounding its supposed position. We cannot make the deductions from the few observations, I suppose about a dozen, made in a limited area on the ice or land. He does not state definitely what his observations at Cape Adare were—whether they were differential observations, or absolute observations; he also does not tell us whether the aurora had any effect on the magnetic instruments. There is a doubt, from what he says, as to whether the locality he examined is not disturbed magnetically; I am not aware that he has given information on that point. I have not heard yet that the ship was utilized to take observations at sea, where they would have been free from local magnetic disturbances. We know from our surveying vessels that the dip differs 30° from the normal at Cossack, in North-West Australia, and I am sorry the *Southern Cross* was not taken out to sea for observations free from local disturbance. I do not know how far from the shore he took his observations on ice. I should again, therefore, like to ask him where he places the magnetic pole now, and whether determined by observation.

MR. BORCHGREVINK: The approximate position of the south magnetic pole, according to the calculations of my observers, is $73^\circ 20'$ S. and 146° E. I did not know that the magnetic pole ever changed round the geographical pole. I believe the observations we were able to make from Coulman island and southward give us information sufficient to justify us in determining the south magnetic pole to be $73^\circ 20'$ S. and 146° E. It differs somewhat from the admirable work of Ross and the theoretical work done by excellent men in Europe, but we know the pole is not stationary. We have reason to believe that these observations made away from the vessel on the ice rather far from the shore, where less local attraction will occur than on the land itself, are under the most modest computations reliable, and a great support to these results is the admirable work done by Prof. Neumayer of Hamburg, whose figures almost coincide with the very excellent magnetic observations of my staff. It is important that a continuous series of magnetic observations

should be carried on at South Victoria Land, as magnetic events once missed we will never be able to work up to again, because what is past is lost, is a missing link, and I, as leader of this expedition, must use my influence to urge on to lose no time. Another expedition must follow in our steps, to add links to that chain which we have been able to pick up from my predecessor, Sir James Clarke Ross.

Admiral McCLINTOCK: I wish to ask one very practical question—whether, in Mr. Borchgrevink's opinion, we could reasonably expect a steamer to visit Victoria Land, and if she reached there, whether she would find his huts in a habitable condition?

Mr. BORCHGREVINK: I went there once as a sailor before the mast, next time in command of an expedition; on both occasions we were able to get to Cape Adare. In 1898 I found the summer season a little bit later than on my first visit. For a well-fitted vessel with good engines the chances of landing are very great, especially if a course is taken east of 170° ; and I believe, under an able leader, which a national expedition naturally would have, that it could be done, and they will be able to carry on the able work of the illustrious Sir James Ross, who worked without the aid of steam. But with steam I think new difficulties arise. I think in a steam-vessel a very important feature is a well to change the propeller without going into dock. There should be two vessels, as I felt if the *Southern Cross* had been crushed we would have had to wait a few years before any one took us off.

The PRESIDENT: In thanking Mr. Borchgrevink for his paper, I think we may sum up with the conclusion that the expedition has done a very interesting and important piece of work. He selected Cape Adare as the place for wintering, and making his efforts at exploration. It appears now that it is practically impossible to penetrate into the interior at Cape Adare, because I suppose that the great mountain range approaches closely to the sea and terminates in cliffs and glaciers broken by enormous crevasses, and it would not probably be practicable for any sledge party to go inland for any great distance. We find from the paper he read that he made many desperate and determined efforts to penetrate inland, but found it impossible. Nevertheless the work that was done at his winter quarters is very important. I think it will be found that the meteorological observations have been taken with great care, and will be extremely valuable, extending over a whole year. The natural history collections are interesting, and some of the specimens, especially the fish and the mollusca, are, I understand, quite new to science. Therefore we have to thank Mr. Borchgrevink, although he was unable to penetrate into the interior, for having done valuable work during the year at Cape Adare. I gather from the paper that he made one attempt to explore the coast to the westward. He also appears to have found that impracticable, and did not get any great distance. To me and most geographers, by far the most important work was done during the period when he was able to land on the great ice-barrier, although I was astonished to find the difference in latitude between Sir James Ross and Mr. Borchgrevink is nearly 36 miles. Now, assuming all the observations to be correct, that can only be accounted for by the barrier having broken off to that extent and formed a bay during a period of 60 years. It is also interesting to know that the landing can be effected on what hitherto we have believed to be continuous cliffs 400 miles in extent. If Mr. Borchgrevink had had more time he might have gone a greater distance to the south. It would appear, from what he says about the places for winter quarters that exist inside Coulman island and at Newnes land, that hereafter the continent may be penetrated by sledges on the principles adopted by McClintock, and important discoveries may be made there. We must thank Mr. Borchgrevink and his staff for the extremely valuable scientific work done at Cape Adare, and for giving us further information about the ice-barrier.

In asking you to pass a vote of thanks to Mr. Borchgrevink for his paper, which is an extremely interesting one, and for his excellent series of photographs, I would also wish to include the members of his staff present here this evening, who have worked so hard and done so excellently in their different departments; and I think we cannot forget Sir George Newnes, who, through his munificent generosity, enabled this work to be done. I now propose a vote of thanks to Mr. Borchgrevink, his staff, and Sir George Newnes.

STUDIES IN THE ANTHROPOGEOGRAPHY OF BRITISH NEW GUINEA.*

By Prof. ALFRED C. HADDON, Sc.D., F.R.S.

WITH regard to the Gulf natives, we may safely regard the short, very dolichocephalic people of Maipua as belonging to a primitive stock. The skulls from the Purari river, which is the same district, have a somewhat higher average index (72 to 73) than the six Maipua men measured by Chalmers (70). Perhaps the skulls are those of enemies taken in battle. The Orokolo and Toaripi people may be regarded as belonging to one group; their cephalic index on the living subject may be taken as 77. They are tall men—1.677 metre (5 feet 6 inches) for the former, and 1.702 metre (5 feet 7 inches) for the latter; but the Rev. J. H. Holmes has measured the stature of twelve Orokolo men, and obtained the high average of 1.715 metre (5 feet 7½ inches)—min. 5 feet 3 inches, max. 5 feet 11 inches. Bevan refers to the high stature of the men on the Aivei (Purari river). He says, "Some would measure at least 5 feet 10 inches (1.778 metre) in height," and states that they approximate to the Toaripi.

Up the Fly river, well in the interior, there is a decidedly dolichocephalic population, which Mantegazza and Reglia have shown to be craniologically allied to the Geelvink bay natives; but even high up the Fly river there are traces of brachycephalism. This is well marked in its delta, where a mixture of peoples has taken place. Some of the inland or "bush" tribes are certainly of the ordinary dolichocephalic type. These appear to be pressed back by a mesaticephalic or low brachycephalic people, who have established themselves at Canoe island, Kiwai, Oriomo, and probably at other places on the coast of Daudai, as I measured a Parama man with an index of 77.2, and a Mawatta man with one of 80.

Torres strait is inhabited by a dolichocephalic people, which has probably remained pure in the eastern group—Erub (Darnley island) and Mer (Murray island), but the western islands appear to have been overrun by a more or less brachycephalic people, who are doubtless of the same stock as those who have occupied the adjacent coast of New Guinea and the delta of the Fly river.

* Continued from p. 291.

These facts can be seen at a glance in the following table:—

Length-breadth index of skull.	Interior, Fly river.	"Bush-men," Daudai.	Kiwai.	Oriomo.	West tribe, Torres strait.	East tribe, Torres strait.	Total.
-73.9	16	10	1	—	33	25	85
74-75.9	3	1	1	—	8	4	17
76-77.9	2	3	4	1	3	4	17
78-79.9	—	—	2	2	9	—	13
80 +	—	—	4	—	11	—	15
Total, male and female ... }	21	14	12	3	64	33	147

So far as I have had time to work it out, the available anthropometric evidence appears to me to warrant the following conclusions; but, in all fairness, I should say that I do not consider that sufficient material has as yet been collected to enable us to form otherwise than tentative hypotheses. I am aware that Dr. Loria has made numerous measurements in British New Guinea, but these have not yet been published, and I have not had time to calculate and tabulate all our own measurements; probably the cranial height, facial, nasal, and naso-malar indices will throw more light on the problem of the distribution of people in British New Guinea.

There appears to be, in the central range, a low brachycephalic people of rather short stature, who harry the short dolicho- or mesaticephalic hill tribes. In certain places they seem to have burst through this somewhat dolichocephalic zone and to have reached the coast. In the Mekeo district this movement is completed, but in the Rigo district the mountaineers are forcing the hill tribes towards the coast, which they themselves do not appear to have yet reached, although they are very close to it. In the central district they have devastated the hill tribes, and in one of their recent raids they came within a few miles of Port Moresby.

There is a dolichocephalic or subdolichocephalic population, which is usually above the average in stature, all round the Papuan gulf. At the eastern end the indices are mesaticephalic, and the stature is remarkably high for Papuans. At Maipua the stature is much lower, and the cephalic index extremely so.

The whole of the Fly river district, including Daudai, appears to be dolichocephalic with distinct traces of low brachycephalism, which appears to be especially strong in the delta of the Fly river. The brachycephals have invaded the western islands of Torres strait, where they appear to have amalgamated with the previous dolichocephalic population, but this movement has not extended to the eastern islands.

The dolichocephals, distributed over the whole of New Guinea and

the adjacent islands, may belong to one ethnic group which has developed along various cultural lines in different places.

The problem of the brachycephals does not appear to me to be anything like so simple. One result of the Cambridge Expedition has been to establish a low brachycephalic population on the western slopes of the central range. Some of these are decidedly short; but, on the other hand, Macgregor speaks* of the natives of Gosisi and Tobiri at the foot of Mounts Knutsford and Musgrave, on the upper reaches of the Vanapa river, as "the best-built men yet met with in this colony. In the gulf, for example, there are as tall men, but they are greatly inferior to these mountaineers in general muscular development, especially in the lower extremities. There was no straight or wavy-haired individual there." We do not know what shaped head these people have. There is no reason, so far as I am aware, to believe that they are otherwise than an autochthonous population. The same may be said for the brachycephals in the Fly river district.

Having been struck by the differences between certain crania from Tud (Warrior island, Torres strait) and those from Erub, Sir William Turner† suggests: "it is not unlikely that these islanders may have had a large admixture of Malay blood." As there is no trace whatever of Malay physical character, culture, or language, this theory does not appear to me to be adequate, and for the present I do not seek outside of New Guinea for the ancestral stock of these people.

The coast brachycephals of the Motu stock—for example, the Bulaa folk—belong to quite a different category. So far as I am aware, the characteristic frizzly hair of the Papuans is universal among the mountain group of brachycephals, but in the Rigo district,‡ and strangely also to a less extent in the Mekeo district, great variation prevails as to the nature of the hair. I have collected every variety, from straight, through wavy and curly, to the most pronounced frizzly or woolly. The Motu people admit they are immigrants.

Finally, there are the brachycephals of Murua, the D'Entrecasteaux, and China strait. The cultural evidence points to their being of a different stock from the Motu. I have elsewhere§ spoken of this ethnographical region as the Massim district; hence these broad-headed people may be termed the Massim brachycephals.

* 'Annual Report, British New Guinea,' 1899, p. 12.

† *Journ. Anatomy and Physiology*, xiv., 1880, p. 485.

‡ We understood that the boy photographed by Mr. Wilkin (p. 270) belonged to the Sinaugolo tribe. If this tribe came from the interior I do not understand how the wavy hair is present; certainly we saw several other examples in the villages near Rigo. Perhaps the Sinaugolo originally migrated up the Vanigela from the coast, and then returned towards the coast in a westerly direction.

§ 'The Decorative Art of British New Guinea,' *Cunningham Memoir*, x., Royal Irish Academy, 1894.

Dr. A. B. Meyer has recently published a translation,* with additions, of two chapters of his great monograph on the Negritos of the Philippines. This critical and cautious essay is a needed correction to loose generalizations, and I can scarcely hope to escape from the criticism of my learned friend, as he considers that "the question whether the Papuans are a mixed race or no is not yet ripe for decision." He himself inclines to the view of the variability of the race as the simplest hypothesis, and as provisionally sufficient. Further, Sir William Macgregor, the late Lieut.-Governor of British New Guinea, who has a unique knowledge of the natives he has so successfully ruled, also rather deprecates an ethnological analysis of the people. On the other hand, it is difficult to make advance in a subject if working hypotheses are not employed. Facts must be grouped to be usable. While I candidly admit that the ethnic variation found everywhere in New Guinea can be brought forward to support Dr. Meyer's contention, I venture to maintain that, however imperfect and even transitory my hypotheses may be, they should at least serve to advance our knowledge by the grouping of facts and by drawing attention to concrete problems.

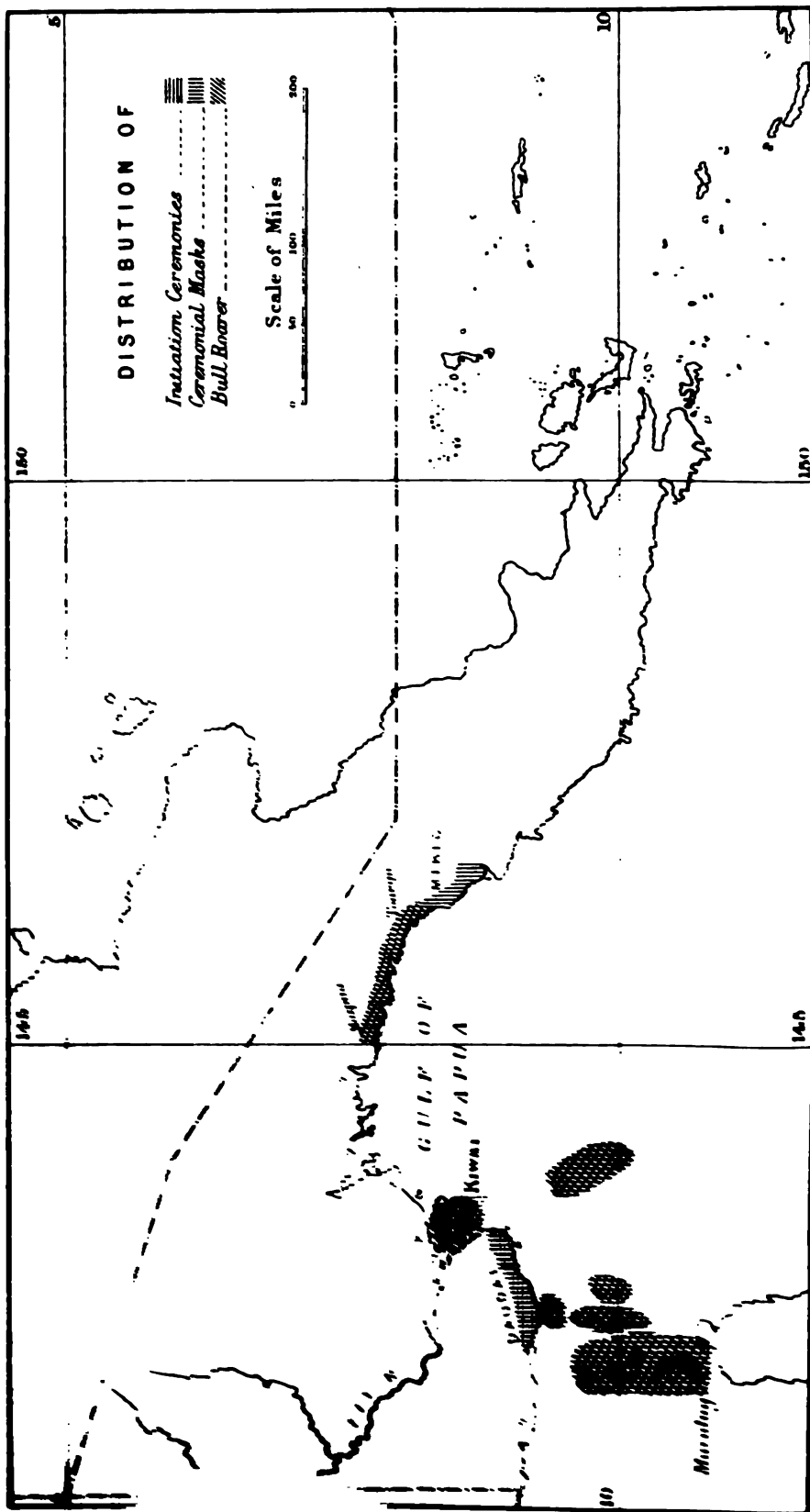
THE GEOGRAPHICAL DISTRIBUTION OF CERTAIN CUSTOMS, ARTS, AND CRAFTS IN BRITISH NEW GUINEA.

The geographical distribution of customs and of arts and crafts is no less significant, probably more so, than that of some of the physical characters of the people. It would have been easy to multiply examples; but I have made a selection of cases that will suffice for my purpose. Many customs and objects are so widely spread that they have no analytic value; others, again, appear to be so local that they, at the present state of our knowledge, can teach us but little. I purpose, then, to bring briefly into review the distribution in British New Guinea of initiation ceremonies, masks, the bull-roarer, houses, canoes, the bow and arrow, spear, pottery, and decorative art. Although the Torres strait islands belong politically to Queensland, I have included them in this survey, as the natives are most certainly Papuans. Some of these facts have been collected together in my two papers, "The Ethnography of British New Guinea" (*Science Progress*, 1894, pp. 83, 227).

Initiation Ceremonies.

On attaining puberty the lads are admitted into the clan or tribe by passing through very sacred and secret ceremonies in Torres strait, Daudai, Kiwai, and probably throughout the whole of the Papuan gulf, but certainly from Maipua, near Bald head, to Toaripi in Freshwater

* 'The Distribution of the Negritos in the Philippine Islands and Elsewhere.' Dresden : 1899.



bay. I have described the initiation ceremonies which took place in Torres strait, and Chalmers gives some interesting information about the Gulf ceremonies—these have been quoted by me in my 'Decorative Art of British New Guinea' (pp. 104-109); and Chalmers (*Journ. Anth. Inst.*, xxvii., 1897, p. 326) may also be consulted.

Masks.

Masks are worn during the initiation ceremonies from Torres strait



"FULAARI," OR MASKED EXECUTIVE OF THE TABOO, WAIMA, MEKEO DISTRICT.

and Daudai to Toaripi. Chalmers states that at the mouth of the Fly river a mask is worn by elderly men who have arrived at the final stage of initiation. If this takes place in Kiwai, it is, so far as I know, the only occasion on which a mask is worn in that island.

Masks are employed for various ceremonies throughout this wide area, but not beyond it to the south-east, save in the Mekeo district, where they are used in one or two places. The villages of this district are divided into two main communities, each with its own chief.

One is the usual headman, who, I believe, is the war-chief; the other is the Afu- (or tabu-) chief. It is his business to put *afu* on coconuts, areca nuts, etc., if he sees signs of failing crops. Certain members of the other community, than that to which the Afu-chief belongs, have the responsibility of seeing that the tabu is observed, and some fourteen or fifteen of these men, who are called "Fulaari," constitute a sort of constabulary. Every evening they go round the village, armed with clubs and disguised with masks, or covered up with leaves so as to be unrecognizable. At Waima all the executive of the tabu wear masks, attached to which are enormous cloaks of leaves; at Inawi and Veifaa they paint the face and cover up part of the body, but they sometimes



BULL-ROAKER AND CEREMONIAL MASKS FROM KARAMA, PAPUAN GULF.

wear masks; at Aipiana they cover over the whole body with leaves. Masks are used for a similar purpose by the Toaripi, according to Chalmers.* In other words, in the Mekeo and Toaripi districts masks have a legal significance, whereas elsewhere in British New Guinea they are, so far as is known, distinctly religious or perhaps in some cases magical insignia. Parallels to this will be found in New Britain, Africa, and elsewhere. The Torres strait and Daudai masks are made of wood or turtle-shell (tortoise-shell); those of the Papuan gulf are constructed of a natural cloth, the designs being marked by cloissons of midribs of palm leaflets, and the spaces coloured black, white, and

* *Loc. cit.*, p. 329.

red. Some masks, very similar to the latter, have been obtained from Kaiser Wilhelms Land, but the cloissons are, I believe, absent; other masks from the German territory are of wood.

The Bull-roarer.

That remarkable instrument, the bull-roarer, is employed in Torres strait, the estuary of the Fly, and along the Papuan gulf. It does not appear to occur in the Mekeo district, and is absent over the whole south-eastern peninsula and adjacent archipelagoes; but it crops up again in German New Guinea. In Kiwai and the Papuan gulf it is employed in initiation ceremonies, as it also was in Muralug (Prince of Wales island), Torres strait. In the other islands it was not shown to the lads during their initiation, but was swung in fishing ceremonies, and I have recently discovered that it was also employed in Mabuiag, as it still is in Kiwai, to make crops grow. In Mer (Murray islands) it was associated with rain-making and used in a ceremony connected with turtle-fishing.

Houses.

The natives of Torres strait have adopted the oblong "South sea" type of house. Formerly the eastern tribe, the Murray islanders, and the natives of Erub and Uga, built small circular beehive huts; of these only one now remains in the Murray islands. The western tribe also built on the ground, but they had more or less oval or oblong huts, with a flat or curved gable roof, and with walls about 2 feet in height, or without walls at all; some were mere shanties or break-winds, except in Saibai and Dauan, where there were pile-dwellings. These houses were inhabited by single families.

In Daudai and on the Fly river long communal houses are built on piles from 100 to 500 feet in length. Many families live in these houses, and I recently discovered in Kiwai that each house is inhabited by members of one clan only, who all acknowledge the same totem: here a woman adopts the husband's totem. The end rooms are the club apartments of the men; the women and children enter the houses by the side doors.

Macgregor says,* among the black people of the coast of the Papuan gulf, and among the lighter-coloured tribes of the interior, it is customary in many places to have large "man-houses" for the males, and smaller "woman-houses" for the women and children. The "man-houses" are sometimes several hundred feet long; those for the women are always smaller. The former are what Chalmers used to call "temples," or *dubus*; this last is a Motu word, and he now terms them by their native name of *eramo*.

Inland the houses are generally straight-roofed, and with each end completely open. They are square or oblong.

* 'British New Guinea: Country and People' (1897), p. 85.

In the whole of the remaining portion of British New Guinea we again find family houses, which are always raised from the ground on posts, except in two widely separated localities.

At Bubuni and Vale, villages on the top of steep hills behind the Mekeo district, and the similarly situated Emene on a southern spur of Boboleva (Mount Davidson) are conical ground houses with elliptical and circular bases. In some places, as on the Adualla affluent of the Alabule (Angabunga), these are oblong, having a short ridge-pole. Fathers Jullien and De Rijke * state that the crests of the mountains are long and straight, and the villages on some of the ridges consist of only a single street of such narrow width that two persons can only just pass;

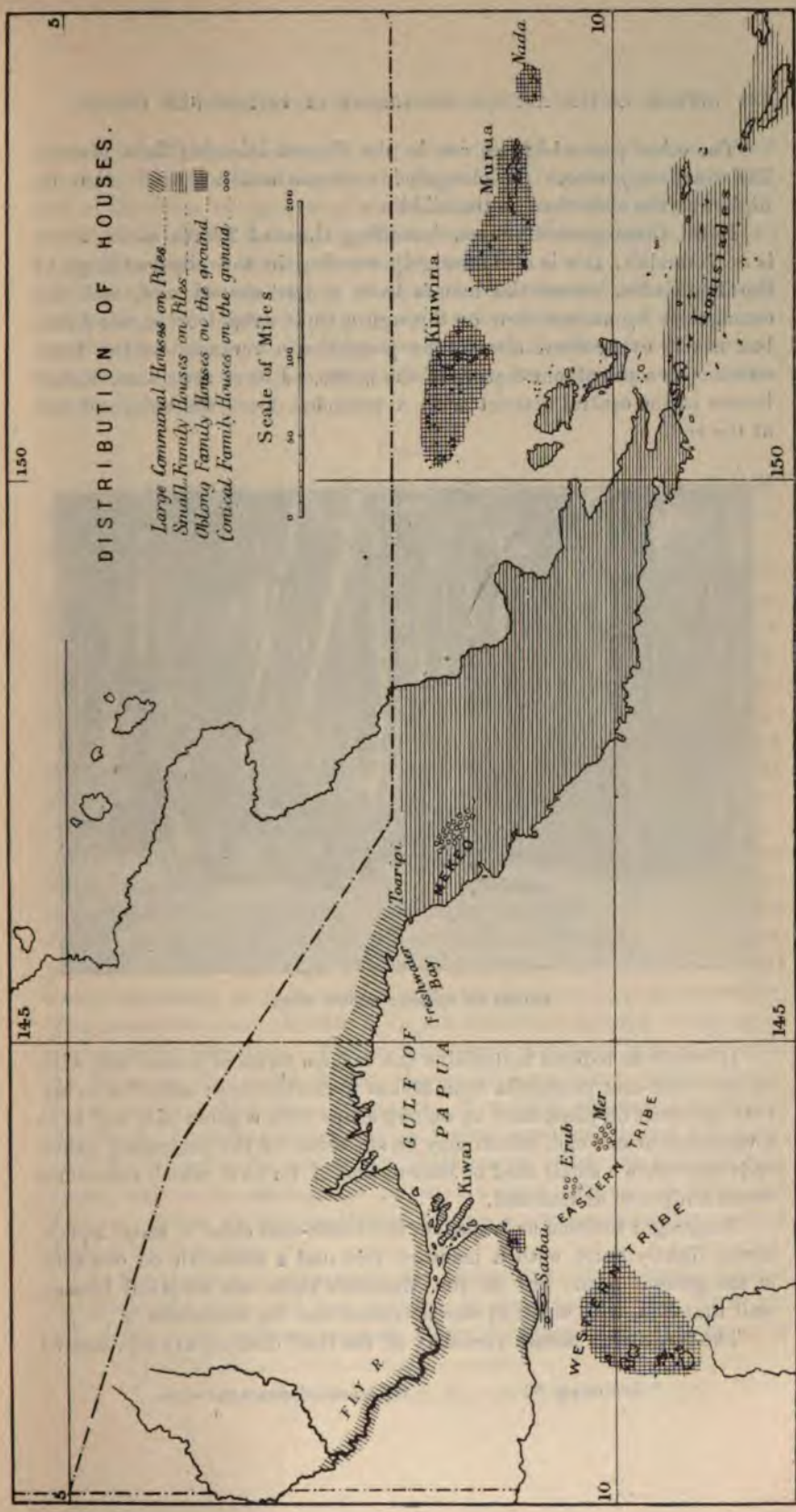


THE LAST ROUND HOUSE IN MEE (MURRAY ISLANDS).

the houses are built partly on the crest, partly on the slope, and the whole village is surrounded by a palisade. In the mountains inland from Oroï (Nara), and about the same latitude, "beehive houses" have been recorded.

Macgregor describes and figures small ground-houses with the gable roof coming right down to the ground at Neneba, on Mount Scratchley. These have a sleeping-platform close to the angle of the roof, to which access is had by a small ladder. These houses might be described as very small pile-dwellings, in which the roof is continued down the sides to the ground. In some there is a pent-roof over the entrance.

* *Comptes Rendus Soc. Géogr. Paris*, 1898, p. 206.



The other ground-houses are in the Bennet islands (Nada, Murua, Kiriwina, etc.), where the elongated roofs are saddle-shaped—that is, higher at the ends than in the middle.

In all these ground-houses, including those of Torres strait, there is no verandah; this is also strangely wanting in the pile-dwellings of the Louisiades, where the houses have a boat-shaped roof, and the entrance is by an end door or through a small trap-door in the floor; but nearly everywhere else in the possession a verandah at the front entrance is a prominent feature of the house. I have seen some Koiari houses in the central district with a verandah down the side, and not at the end.



HOUSES IN COCONUT GROVE, NADA.

It would be tedious to describe the various forms of houses met with on the south-east peninsula from Mekeo to South Cape; suffice it to say they are built on piles, have an oblong shape with a gable roof, and have a verandah at one end, which may be sheltered by the projecting gable, or it may have a small shed or lean-to roof of its own, which sometimes forms a hip-roof at that end.

Macgregor informs us * that on the north-east coast a small square house, lightly built, with a mansard roof and a verandah on one side, is the general form; but on the Mambaré there are elliptical houses, well thatched, with small square entrances and no verandahs.

The large club houses (*crano*)† of the Gulf district are represented

* *Ira. vol.*, p. 86.

† Also called *clano* and *crano*.

by decorated houses (*marea*) in the Mekeo district; and further down the coast beyond Port Moresby, at Lakwaharu (Tupuseleia), Kapakapa, and in the other villages round about Rigo and in the Hood peninsula, Bulaa (Hula), Babaka, Kalo, etc., these are replaced by open-air platforms (*dubu*), the posts of which are usually carved.

The houses of the marine villages of Lakwaharu, Gaile, Kapakapa, and Bulaa, do not differ in any essential point from those on the shore.

The tree-houses of the Koiari and other hill-tribes in the central district are merely places of refuge; they are occupied only when danger threatens.

Canoes.

The distribution of the various main forms of canoes in British New Guinea has many interesting features. Everywhere the canoes are dug-outs, but sometimes a free-board is lashed on to the hull.

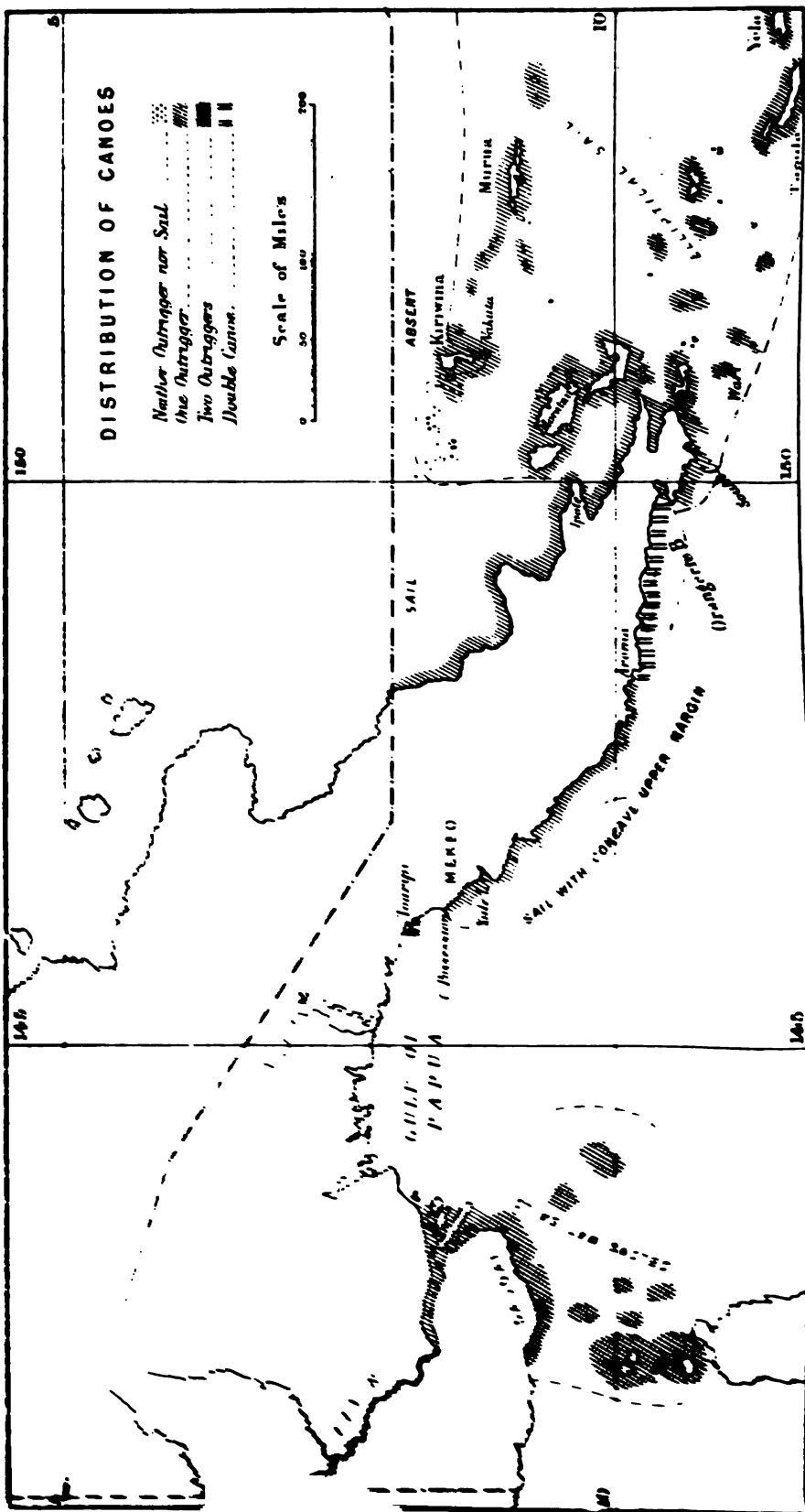
The Torres strait canoes were imported from the mouth of the Fly river, but the islanders and the Daudai coastal people furnished them with a free-board and a double outrigger. The latter consisted of two long thwart poles, to the ends of which a float was attached; a platform was built on the thwart poles in the centre of the canoe. Two large oblong mat sails were erected in the bow of the canoe.

On the lower Fly the inefficient small canoes have a single long slender outrigger at a great distance from the canoe. Their small sails are oblong mats. Up the Fly river the narrow canoes have no outrigger or sails.

Between the Fly and the east of the Gulf of Papua the sail seems to be quite unknown, and there is no outrigger. Macgregor points out that the special peculiarity in the construction of the canoe of this district is that it seems designed more to let the water out than to prevent it from entering. It has neither prow nor stern, but is cut away from above at each end in a gentle curve, so that the extremity, if it meets the water, divides it in the horizontal instead of the usual perpendicular direction. The extremes are about level with the water. At Biroe, on the upper Purari, the canoes have sharp vertical, high-ended prows; there is no outrigger. The large war-canoe (*lakia*) of the Toaripi* consists of two canoes lashed together about 6 feet apart, and the bridge in the centre is a platform on which the fighting men stand, and to the railing are fastened a large number of bows and arrows. When we were at Delena we saw a similar canoe arrive from further up the coast.

In the rivers and estuaries of the Mekeo district the canoes have a flat projecting stern end, and the bow is blunt and clumsy. They are all of one piece, and are pushed along by poles. These seem to be

* J. Chalmers, *Journ. Anth. Inst.*, xxviii., 1897, p. 327.



somewhat similar to the canoes used by the Tugeri pirates from just beyond the Dutch boundary.

All along the seaboard of the central district as far down as Keapara (Kerepunu) the canoe is generally single with an outrigger, which is lashed by many poles to the canoe; it is sharp and high-pointed at each end. The great majority of these canoes are made at Keapara. From Aroma to Orangerie bay the sailing-canoe is double, with the sides often increased in height by boards sewn on to the hard wood. From Yule island to Orangerie bay the sail has an elongated heart-shape, sharply pointed at one end, and with a deep crescentic notch at the other.

From Orangerie bay to Tagula (Sudest), and Murua, much more handy and skilfully-made canoes are in use. They are formed of boards, which are sewn, caulked, and decorated, and built on a strong curved hard-wood keel. All are provided with a long outrigger of light wood. The sail is elliptical in form, the whole circumference being kept in shape by a light frame of saplings. The war-canoe of the east end was used from South Cape to Tauputa, and from Moratau (Fergusson island) to Wari. It is long and narrow, with an outrigger of the same length as the canoe, and only about 2 feet distant from it. The Yela (Rossel island) canoe is different from any other, and is the most skilfully made canoe of any in the possession. It has an outrigger, but no sail. It is built up from a hull, and is in form something like a Rob Roy canoe, there being a central walled-in well, while the fore-and-aft projections of the hull are hollowed out and then securely boarded and caulked. There are no sailing-canoes in Kiriwina (the Trobriands); but the Vakuta people possess the best sailing-canoes in the group. Vakuta is a small island immediately to the south of Kiriwina, and almost joining it.

No native sail has been seen at sea or on shore on the coast north of Ipote. The canoes are sharp, high-ended, and made from one tree. They are always provided with one long thin outrigger, at an unusual distance from the hull.

Most of this information has been culled from Sir William Macgregor's book 'British New Guinea,' pp. 54-59.

Bow and Arrow.

The bow and arrow are the main fighting weapons of the west. They were used in Torres strait, but were imported there from the mainland of New Guinea. Their use is universal from the Dutch boundary, all along the Papuan gulf, and in all the interior country behind. About Cape Blackwood, the bow, instead of being made of the male bamboo, is constructed of palm wood, and its use once extended as far as Redscar bay, but further east it entirely ceased. The bow and arrow are wanting at Babuni and Vale, and I think also among the



Uni Uni, who live on the southern spurs of Mount Boboleva (Mount Davidson) at the back of the Mekeo district. They are, however, employed a little lower down the central mountain range; but here they are by no means the formidable weapons they are in the Papuan gulf—for example, at Neneba on Mount Scratchley the bow is of palm wood, is weak, and about 3 feet long, with a string made of a strip of cane; the arrow has a reed shaft and a wooden point without barbs. The bow and arrow have not been seen on the lower Mambare, nor do they appear to occur in the main range south of the Scratchley *massif*.

Spear.

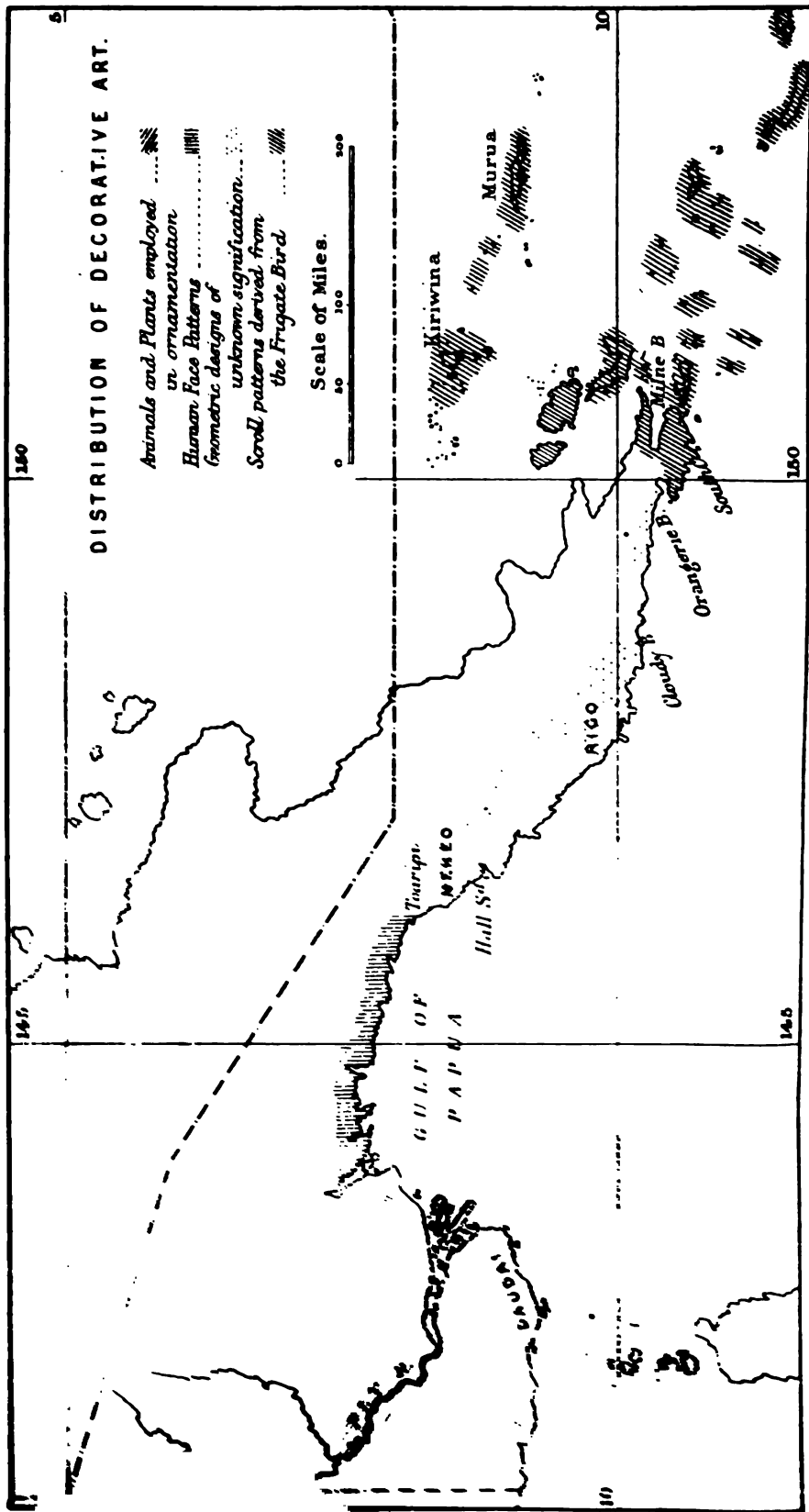
The spear replaces the bow and arrow in the rest of the peninsula and in the archipelagoes beyond. These weapons overlap in Redscar bay, the Kabadi country, and in the Mekeo district. The spear is usually made of palm wood; it is always in one piece, and is generally barbed on one side.



POTTERY-MAKING AT HANUABADA, PORT MORESEY.

Pottery.

The art of making pottery is by no means universal in New Guinea, and it is limited in a suggestive manner in the possession. It is entirely unknown in Torres strait and in the whole of the Fly river basin and to the west of it. Throughout the whole of the Gulf district pottery has only been met with some way up the Vailala river. No information is given as to the method of manufacture; but, as the articles are very rude, we may assume they are simply fashioned out of a lump of clay, and that probably a stone and beater are employed.



No interior tribes of the south-east peninsula make pottery; but along the western coast the Motu settlements are the seat of a considerable pottery industry, and most coast natives can distinguish between the pottery of different villages, and even recognize the handiwork of individual women, for this is entirely woman's work. The pottery is made out of a lump of clay, which is first moulded by the hands and then beaten out by means of a wooden beater and a stone held within the pot by the left hand. Pots made in Port Moresby are exported to the Papuan gulf. Pottery is made in the villages of Pinupaka, Ziria, Delena (in the Mekeo district), Manu Manu in Redscar bay, Lealea in Caution bay, Boera, Borepada, Port Moresby, and Pari—these are Motu villages, and also by the Aroma tribe chiefly at Maopa.

In the Engineer group, and especially in Wari (Teste island), the clay is laid down in a spiral, and no stone or beater is used, but the pot is smoothed with a *Tellina* shell.

The only other locality in the possession where pottery is made is near the German boundary. Thick, coarse pots, usually nearly covered with rude incised patterns, mainly zigzags, are made at Gona bay (Holnicote bay), but another style of decoration occurs at Waututu. There is no information as to the manner of manufacture of this pottery. In German New Guinea pottery is made from the lump, as among the Motu, at Humboldt bay, Dallmann harbour, Astrolabe bay, and elsewhere.

Decorative Art.

There are many interesting features in the distribution of decorative designs in British New Guinea; but as I have elsewhere* dealt so fully with this subject, I need not do more than point out the salient features.

On referring to the sketch-map, it will be seen that I distinguish four main districts, which may be designated as the Western, Gulf, Central, and Massim or Eastern regions. These can be further subdivided, but for the present I will briefly describe the artistic characteristics of these four regions.



CARVED WOODEN BELT, PAPUAN GULF.



"GEOMETRIC" PATTERNS ON A WOODEN COMB FROM MER, TORRES STRAIT.

* * The Decorative Art of British New Guinea: a Study in Papuan Ethnography, Cunningham Memoir, x., Royal Irish Academy, Dublin, 1894. *Evolution in Art*, 1895.

Our knowledge of the Western region is confined to objects collected in Torres strait, the coast of Daudai, and the lower Fly river. Most of the decorative objects are bamboo tobacco-pipes, drums, masks, and a



RUBBING OF PART OF THE FOLIAR DECORATION OF A DRUM FROM THE FLY RIVER.



A, B, C, DRUMS FROM DAUDAI, WITH ANIMAL AND PLANT DESIGNS.

few ornaments, combs, etc. These may be ornamented with "geometrical" patterns, but there is not much real variety in the designs, and there is a marked absence of double curves. Even simple curves, such as bowed lines, are not very common; some of these may be regarded as rounded chevrons rather than deliberate crescents. I have recently found that many of the simple "geometric" designs are conventionalized represen-



1. "GEOMETRIC" PATTERNS BURNT ON A BAMBOO TOBACCO-PIPE FROM THE CENTRAL DISTRICT.
 2. PROW OF A CANOE CARVED WITH HEADS OF THE FRIGATE BIRD, MASSIM REGION.

tations of natural forms. Very characteristic of this district is the representation of animals and plants; the former are often cleverly drawn. I discovered the presence of totemism in Torres strait ten years ago, and suspected its occurrence on the mainland of New Guinea. I some time ago put forward the view that the delineation of animal forms was primarily due to the influence of totemism; but I could not account for the plant forms which characterized the art of the Fly river,—I now know



SHIELD AND CEREMONIAL OR MAGICAL TABLETS FROM THE PAPUAN GULF.



CARVED WOODEN BELT FROM THE PAPUAN GULF.

that this is due to the prevalence of plant-totems. Spirals occur in the Fly river, but not in Torres strait.

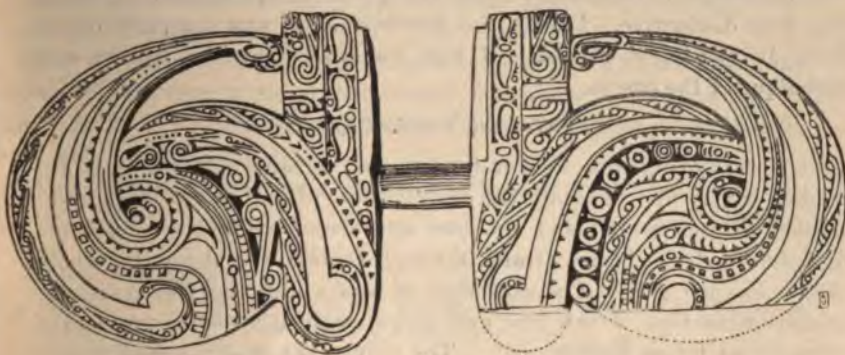
The decorative art of the Papuan gulf is characterized by the employment of the human face. This degenerates into all sorts of bizarre



1



3



2

1. FRIGATE-BIRD SCROLLS CARVED ON A CLUB, MASSIM REGION.
2. DANCING SHIELD WITH FRIGATE-BIRD DESIGNS, KIRIWINA.
3. LIME GOURD WITH BURNT DESIGN, KIRIWINA.

patterns. The human form and occasionally animals are pressed into the service. There are few geometric designs that cannot be derived from the human face. Spirals are common. Chalmers * states that the Toaripi "know nothing of carving;" hence most at least of the carved objects stated to come from Toaripi probably originally come from further west.

In the Central region the patterns are "geometric," and their origin is at present unknown; some look as if they might be plant derivatives. Animals are scarcely ever introduced into the decoration of pipes, and then, I believe, only in the Mekeo district; in the same district only do spirals occur.

A very different style of ornamentation is found in the neighbourhood of South cape and Milne bay, and in all the neighbouring islands—that is, in the Eastern or Massim region. Scroll patterns are universal, the vast majority of which are derived from the frigate-bird. The crocodile also enters into many designs, as do other animal forms. Quite recently we have learnt that totemism occurs in this district, and this must be held responsible for many of the zoomorphic designs. It should be remembered that the frigate-bird is the sacred bird of the West Pacific, and is revered over a large area. The human form is frequently carved, in Murua especially. Spirals are very frequent.

The technique of the decorative art is as characteristic as the motive in each region. The pipes of the Western region have etched designs; the patterns of those of the Gulf are in low relief; the pipes of the Central region are usually decorated with burnt-in patterns; but in the Cloudy bay area, instead of the pattern being burnt straight away on the bamboo, the designs are first sketched in outline and then burnt in. The most beautiful and delicate burnt-work of all peoples is to be met with on the lime-gourds of Kiriwina. I have recently found incised patterns on pipes in the Mekeo district, which somewhat resemble those of the western region, and in the Rigo district, which are *sui generis*. The decoration of the shields of the Gulf, Central, and Massim regions is also very distinctive. Indeed, the provenience of any decorated object from British New Guinea can now be located by the motive and technique of the design.

General Conclusions.

On comparing the five cultural maps, certain main features are readily apparent. Taking the distribution of initiation ceremonies, masks, the bull-roarer, and the bow and arrow, we find a continuous distribution from Torres straits, through Daudai and along the whole of the Paupan gulf. The extension of masks into the Mekeo district accords with that of the bow and arrow, which, however, previously extended as far as Redscar bay. The occurrence of communal houses is also characteristic of and peculiar to the gulf, the Fly river, and

* *Journ. Anth. Inst.*, xxvii. p. 332.

Daudai; but they did not extend to Torres strait. On the other hand, south-east of Cape Possession and right as far as Murua and Yela, small family houses alone occur. Canoes with a single outrigger and palm-leaf sails have a similar distribution, except, according to Macgregor, for the absence of sails on the north-east coast or at Kiriwina. Spears, too, have practically the same distribution.

It is thus evident that a division can be made into a western and an eastern group of handicrafts, the dividing-line being somewhere about Freshwater bay. Further evidence for this western and eastern division is afforded by the fact that in the latter tattooing is very widely spread, except in the interior; whereas the marking of the body by means of scars is confined to the Western Papuans. It is only quite recently that a few individuals in the west have adopted a little tattooing owing to intercourse with the Eastern Papuans or with Polynesians. Again, so far as my experience goes, men and women never dance together in the west, but this is the usual practice in the east, at all events among the so-called "Melanesian" tribes. The style of dancing, also, is entirely different in these two divisions.

The maps of the distribution of canoes and decorative art clearly indicate that each group can be further subdivided, and we have (a) a western subdivision, in which the canoes have two outriggers and an oblong mat sail, and in which the animals and plants enter into the decorative art; and (b) a Gulf subdivision, in which the canoes have neither outrigger nor sail, and in which the patterns are almost invariably derived from the human face. The eastern group is divisible into (c) a central subdivision, in which the sails of the canoes have a concave upper margin, and the decoration consists of "geometric" patterns, recognizable animal motives being practically absent; and (d) an eastern subdivision, in which the canoes have an elliptical sail, and in which the frigate-bird so permeates the decorative art that scarcely an object can be found which has not some trace in scroll, spiral, or circle of that sacred bird.

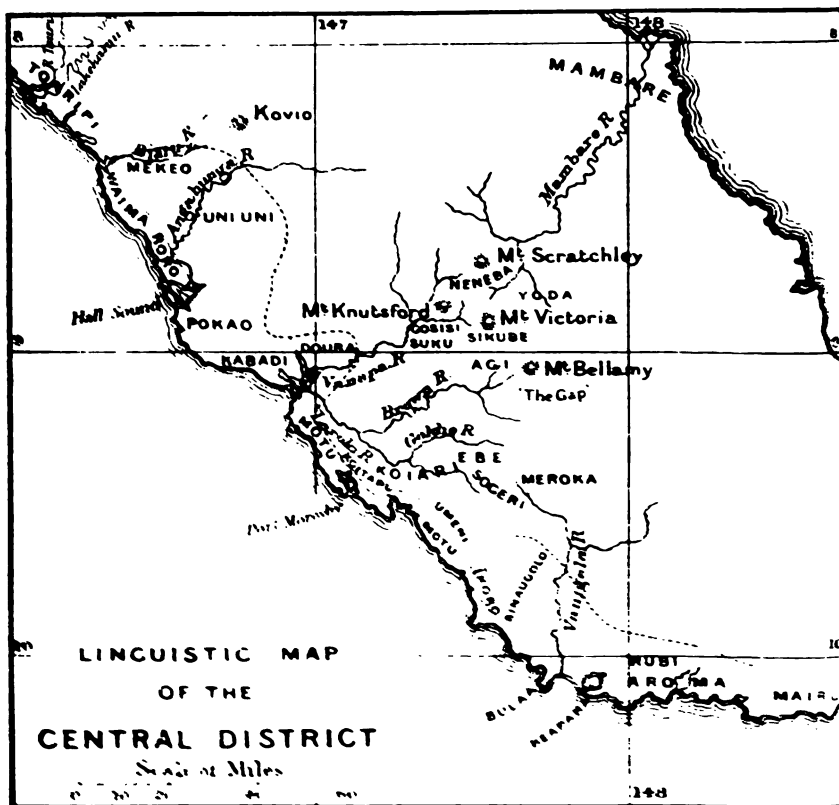
The Fly river probably constitutes a subdivision of its own, and the central subdivision is more complicated than these maps indicate. I hope on a future occasion to discuss this problem at greater length, and with additional cultural evidence.

The thirty-one languages or dialects known to Mr. Ray may be grouped thus:

A. NON-MELANESIAN—

- I. *Koiari*. Agi, Ebe, Sogeri, Koitapu, Koiari, Eikiri, Hagari, Maiari, Meroka, Favere, Kupele, Gosisi, Suku.
- II. *Neneba*. Neneba, Iworo.
- III. *Sikube*. Sikube.
- IV. *Mambare*. Mambare, Yoda.
- V. *Umeni*. Umeni.

B. MELANESIAN—

VI. *Mekeo*. Mekeo, Uni Uni.VII. *Roro*. Roro, Waima.VIII. *Kabadi*. Kabadi, Pokao.IX. *Motu*. Motu, Doura.X. *Sinaugolo*. Sinaugolo, Rubi, Aroma or Keakalo, Keapara, Bulaa (Hula).

Mr. Kay has established the occurrence of two groups of languages in British New Guinea. One of these he terms "Papuan," and the other "Melanesian," as it has close connection with the languages spoken in the great chain of Melanesian islands. Including and west of Toaripi, all the languages are "Papuan," as are also those of the inland people of the peninsula. Of these the following speak "Papuan" dialects: the tribes on the Mamberi, Mount Victoria, Mount Knutsford, the Vanapa and Ianki rivers, including the Keam, Kilingu, Meroka, probably the Iumet and Ikene, and the Mairu of Cloudy Bay and Orangerie Bay. So far as Mr. Kay knows there is no connection between Toaripi, the sum of two known groups, and the Mairu, either in grammar or vocabulary. Mr. Holmes states that Toaripi is spoken some distance

inland. The Koiari group of languages shows two fairly distinct divisions; one of these may represent the mountaineers, the other is the true Koiari. No information is yet to hand on the grammatical construction of the mountain languages.

According to Mr. Ray, the Mekeo, Uni Uni, Waima, Roro, Pokao, Kabadi, Doura, Motu, Sinaugolo, Kalo, Bulaa, Keapara, Aroma, and the Rubi (inland to Aroma), speak "Melanesian" dialects. Mekeo is Melanesian in grammar, but altered by some intrusive element. Waima and Roro are the same language—the difference is only in pronunciation; Waima has no trace of the Gulf language. Pokao may belong to the Motu group. Doura and Motu are the same. Sinaugolo is the principal language of the remaining group. Rubi and Keakalo are almost identical with it. Keapara and Bulaa differ only in the pronunciation of some words; the structure of all these dialects is identical. The grammars of the Mekeo, Waima, Roro group are very much alike, but are distinct from the Pokao, Kabadi, Motu, Sinaugolo, etc., group. Mr. Ray has kindly permitted me to make use of the foregoing unpublished material.

Mr. Ray had previously stated that the "Melanesian" dialects of Milne bay district and of the archipelago beyond are of a somewhat different character from the former group. In fact, he goes so far as to say "the language of Suau (South cape) appears very similar to those of San Cristoval, in the Solomon islands, which lies almost due east of South cape. The Motu and Kerepunu (Keapara) agree more with the languages of the Efate district, in the Central New Hebrides." *

It is not possible at present to fit in all these facts with our existing knowledge of the head-form of the natives of British New Guinea.

The dolichocephals may certainly be regarded as an autochthonous people; physical anthropology, ethnography, and linguistics are fairly well in accord on this point.

The eastern insular, or Massim, brachycephals present little difficulty; they may safely be regarded as an immigrant people that came from the Melanesian archipelago and saddled themselves on a pre-existing dolichocephalic population.

I confess to experiencing a great difficulty in deciding about the brachycephals of the central district. Provisionally, I would suggest that we have here to deal with a dual element: (1) An inland group which is gradually forcing its way to the coast; there is at present no reason to believe that this is not an indigenous group. (2) The Motu stock, which apparently is an immigrant people.

There is also the problem of the origin of the western brachycephals. These I regard as a branch of the autochthonous brachycephals, whose presence has now been proved by me in the central district.

* *Journ. Anthropol. Inst.*, xxiv., 1894, p. 32.

Future research may perhaps determine whether the brachycephals have all along existed side by side with the dolichocephals in New Guinea, or whether they have immigrated into New Guinea at various times. If the latter prove to be the case, then we have in British New Guinea at least three distinct migrations, the oldest being that of the western and central brachycephals, the Motu and the Massim brachycephals representing later but entirely separate waves.

After the reading of the paper, the following discussion took place:—

MR. SELIGMANN: I am sure we must all have been very much delighted with the paper, but I don't think any one, with the exception of Mr. Ray, was quite as delighted as I was. We were with Prof. Haddon on this expedition. He said something about the extreme sweetness of the native. Well, he was something of a demigod to them, certainly rather more than a father. At Murray island they said, "He close up alongside God. He savvy too much."

There are one or two points I might mention this evening. In the maps of New Guinea one or two things came out very markedly; for instance, the Mekeo district, where there are large fertile plains of recent alluvial soil, is the place where the best yams grow. That district is the chief, if not the only, one on the south-eastern coast of New Guinea where we have a large amount of leprosy; it is endemic. The interest of that is that recently a book has been published, a prize essay on leprosy, by Dr. Ashburton Thompson of Sydney, in which he treats the history of leprosy carefully, and shows that it is almost certain that leprosy, in Australia, was introduced by Asiatics, perhaps Chinese. There is no record of it before they came. Well, in this fertile valley in New Guinea we have it, not only in the coast villages—possibly there it has some connection with the mangrove swamps—but right up inland. I have seen cases in villages 18 to 20 miles up the river, where it is absolutely certain there is no trace of Asiatic contamination. Then, again, the system of charms and magic varies immensely. In Port Moresby, and extending down the coast as far as the Rigo district, stones play a large part in the system of charms. You find a black stone which has a more or less superficial resemblance to a yam in shape. This, the native says, is a charm for yams. It is used as follows: You pour a little water over it, and then let the water fall on the seed-yams; that will always give you a good crop. If you find a stone with a slight constriction in the middle, like an egg-glass with a broad waist, that form of yam-stone has only to be kept in the house, then there will be plenty of yams. I have known the stopper of a Worcester-sauce bottle left on the side of a hill, where the rain-water could sweep over it before coming down on the fields to wet the roots of the bananas and yams. In the Mekeo district there is no trace of that. The people are agricultural, but they have absolutely nothing corresponding to the yam-stone. The same thing is found in regard to the fishing magic: it is totally different in the different districts, and I think the same may be said as regards their medicine charms and sorcery charms. In New Guinea there is an extraordinary percentage of albinos, and there is nothing more odd than to see a frisky-headed native of a pinkish white colour; his eyes, however, are not pink like those of European albinos or white rats, but are of a grey colour.

MR. RAY: At this late hour I do not propose to make many remarks. I had the pleasure of seeing in the flesh what you have seen in the shadow. My own special province was linguistics, and the languages generally bear out the evidence Prof. Haddon has got together to illustrate the distribution of culture. In the western part of New Guinea, and in the interior districts, the type of language

is very different to that on the coast and in the south. In the south-east the languages are very closely allied to those of Fiji and the Solomon islands and the New Hebrides, while the languages of the west and central districts are entirely different. No specimens of the grammar of the languages save those I was able to obtain have yet been gathered, but, generally speaking, they bear out the conclusions derived from the study of the other features of the people.

The PRESIDENT: The interest of this paper to us, and our science, is that it shows how the geographical features and physical aspects of a country react upon the industries and arts, customs and character, of its inhabitants. Prof. Haddon, in his excellent address, has shown and explained that to us very fully, and he has done so with the aid of the most beautiful and interesting series of illustrations by photographs we have almost ever seen in this hall. I am sure that you will all wish to pass a very cordial vote of thanks to Prof. Haddon for his address.

GEOGRAPHY AT THE BRITISH ASSOCIATION, BRADFORD, 1900.

THE Bradford meeting of the British Association for the Advancement of Science proved to be one of the most successful of recent years. The hospitality of the citizens of Bradford, both in their corporate and in their individual capacities, was almost unbounded, and the weather continued with scarcely an exception bright and cool. The Geographical Section was most commodiously housed in the Church Institute, and the descriptive papers drew as large audiences as ever. The more scientific papers, however, were sometimes read to a nearly empty hall. Much assistance was rendered to the work of the section by the diligence and enthusiasm of Mr. Wethey, the local sectional secretary. The complete list of sectional officers was as follows—the names of persons unqualified by presence at the meeting or membership of the Association being omitted:—

President: Sir George S. Robertson, K.C.S.I. *Vice-Presidents:* Sir Thomas H. Holdich, K.C.I.E.; Dr. H. R. Mill; Dr. J. Scott Keltie; E. G. Ravenstein. *Secretaries:* H. N. Dickson, B.Sc. (Recorder); Edward Heawood, M.A.; E. R. Wethey, M.A.; *Committee:* Lieut.-Colonel F. Bailey; J. Bolton; G. G. Chisholm; Vaughan Cornish; H. T. Crook; Dr. H. O. Forbes; R. A. Gregory; Colonel D. A. Johnston; J. E. Marr, F.R.S.; Staff-Com. Dubois Phillips; T. G. Rooper; Eli Sowerbutts.

The section met on four days, and, in addition to the presidential address, twenty papers or reports were brought before it. Sir William Turner, President of the Association, was present when the presidential address of Section E was read, and at its close he moved a vote of thanks to Sir George Robertson in terms of high appreciation. The full text of the address is published in this *Journal*, p. 447.

On Thursday, September 6, the afternoon was occupied by two papers on educational subjects and an interesting discussion upon them. Mr.

T. G. Rooper, one of her Majesty's Inspectors of Schools formerly in the Bradford district, dealt with the "Progress of Geographical Instruction in Elementary Schools," especially in the West Riding. He said that the West Riding of Yorkshire held the foremost place in the movement for reform in methods of teaching which was begun through the Royal Geographical Society. The first impulse came from the Yorkshire College, and then active steps were taken in Leeds, Bradford, and Sheffield, and the movement was much stimulated by the exhibition of the Royal Geographical Society's collection of foreign maps in Bradford in the year 1887. The conferences following this exhibition discovered the chief defects in the existing instruction: (1) lessons in geography were not based on object teaching, nor on the observation of local features and scenery; (2) the art of "reading" maps was not taught, nor was the construction of a map led up to by making plans of short walks and diagrams of the neighbourhood; (3) the study of political and commercial geography was not based upon the study of physical geography, neither were the details of geographical study connected as cause and effect. There was no attempt to present a country to the scholar as a connected whole, and the lessons consisted of lists of names and figures, at the best arranged in groups. Of such details many were wholly unsuited to the elementary stage. The chief reforms consisted in the intelligent study of local geography through local maps and models, and in object lessons which explained the principles of physical geography. The reliefs and models led up to the art of reading maps and to the demand for better maps. Such lessons were an excellent introduction to reasoning, and proved how little there was that was purely arbitrary even in the sites of towns and villages in the neighbourhood, much less in the industries which were carried on in them. The necessity for good wall-maps was now apparent, and correctly drawn details were demanded in place of vague and inaccurate sketches. The symbols on the wall-map were vague and meaningless unless a context and significance were given them by previous practice in the building up of local plans and maps. The scholar had to be taught with care how to translate the symbols of the wall-map back into the forms of nature which they, however inadequately, represented. The value of graphic work in teaching geography was insisted on. The mere copying and colouring maps of various parts of the world was rather an exercise in drawing than in geography. Each map should be drawn to serve some definite purpose. It should disentangle from a complex whole some particular part which analysis brought to light, and illustrate it with precision and simplicity. Further, the sketch-maps should proceed from simpler studies to more complex, and no map should be made of a country as a whole until the leading features had been dealt with separately, and thus the "constructive" method of teaching geography was introduced.

In conclusion the formation of local geographical societies for educational purposes was recommended, and an account was given of the formation and working of the Southampton Geographical Society.

Mr. E. R. Wethey described the methods he employed in the teaching of commercial geography, and exhibited a large number of exceedingly effective lantern slides of his own construction, which he had devised to enforce the points of his lectures. Both papers were discussed together, Dr. H. R. Mill, Mr. S. P. Unwin, Mr. C. T. Whitmell, and Dr. Scott Keltie uniting in expressing admiration of the work done in promoting geographical education by Mr. Rooper and Mr. Wethey. A number of boldly executed reliefs of typical geographical features and of local configuration made by Yorkshire schoolmasters was shown at the meeting.

On Friday, September 7, Dr. H. R. Mill read a paper on the "Treatment of Regional Geography," with regard to which the opinion was expressed by several speakers that the most convenient unit for such descriptions was the county rather than the map-sheet, and that local scientific societies should be encouraged to take up such work.

Mr. E. G. Ravenstein read a paper on "Foreign and Colonial Surveys," which will be published in a subsequent number of the *Journal*, and a communication from Mr. B. V. Darbishire on "Military Maps" was brought before the meeting by the recorder, in the unavoidable absence of the author. Captain H. H. P. Deasy had a crowded audience when he described, in the afternoon, the incidents of his great journeys in Central Asia, particulars of which appear in the *Journal* for August, p. 141. Prof. J. Milne read a paper on "Large Earthquakes recorded in 1899." He said that in 1899 at Shide, in the Isle of Wight, 130 earthquakes were recorded. The greater number of these were also observed at Kew, whilst very many of them were common to registers from Canada, the Cape of Good Hope, India, Java, Japan, and other distant countries. Analysis of these records has increased our knowledge respecting the rates at which motion is transmitted through the Earth, and indirectly thrown new light upon its rigidity. The velocity of surface waves has been investigated, and new rules based on these investigations have been formulated for determining the position of earthquake origins. It has, for example, been shown that the distance of an origin from a given station can be determined either from the interval by which the preliminary tremors outrace the larger surface waves, or from the interval between the arrivals of waves which had travelled from their origin round the world in opposite directions. One series of observations showed that the amplitude of the large waves of earthquakes decreased more rapidly when traversing suboceanic paths than when they radiated over continental surfaces. In discussing the nature of large waves this observation on the damping effect of oceans was used as an argument that this form of seismic movement represented

gravitational surface waves rather than the outcrop of distortional waves propagated through the body of the Earth. One hundred and twenty-five out of the 130 records considered represented disturbances which had suboceanic origins, and if we except one group we see that the Pacific origins are on the face or at the bottom of "deeps," which form portions of the trough or troughs around the eastern and western margins of that ocean. If future soundings show that the indicated exception is only apparent, then the second group will also illustrate the rule that accelerations in secular adjustments of the Earth's crust are most frequent where this exhibits the greatest flexure. As there are reasons for believing that each of these earthquakes was accompanied by large mechanical displacements of solid materials, the importance of localizing the sites where such changes are frequent is evident to those who select routes for deep-sea cables.

The Report of the committee on the climate of tropical Africa was presented, and the committee asked to be reappointed, in order that its work might complete the record of ten years' observations.

On Monday, September 10, Sir Thomas Holdich opened the proceedings by an important paper on "Railway Connection with India," which he considered under the following heads:—

"1. The impracticability of the northern approaches to India leading over the Hindu Kush into Kashmir or Afghanistan from the Oxus regions.

"2. The nature of the great transverse water-divide of Asia, which includes the Hindu Kush, and the most favourable points for crossing it.

"3. The opening afforded by the Hari Rud river to the west of Herat.

"4. The configuration of the Persian plateau and mountains, and its adaptation to railway alignment.

"5. Consideration of Persian lines of communication with Western India. The coast-line between Basra, at the head of the Persian gulf, and Karachi. Details of alignment. Commercial and climatic objections to such a line as far as Bandar Abbas.

"6. Alternative central line from Western Persia to Bandar Abbas. Difficulties of connection with European systems.

"7. Details of alignment between Bandar Abbas and Karachi. Difficulties of coast line, and possibility of interior central line.

"8. The proposed connection between Kushk and Chaman (*i.e.* the Herat-Kandahar line). Geographical conditions that exist between Kushk and Herat, and between Herat and Kandahar. Their favourable nature.

"9. Objections which have been raised to the line—political and military. Its commercial prospects."

Mr. C. Raymond Beasley described a recent trip eastward on the Siberian railway, and gave some historical data as to the development of Russian Asia, and Mr. R. T. Günther showed the importance of the

detailed study of submerged buildings in the neighbourhood of the Phlegrean fields, in order to arrive at some definite conclusions as to the date of the great changes of level.

Mr. C. E. Borchgrevink attracted a crowded house to hear his description of the British Antarctic Expedition of 1899-1900, under his command, and Mr. C. J. Cutcliffe Hyne contributed some notes of a holiday trip through Lapland.

The proceedings of the day terminated with the Report of a committee on the revision of the physical and chemical constants of sea-water. This committee was appointed to co-operate in the investigations undertaken by Dr. Martin Knudsen at Copenhagen, at the instance of the committee appointed by the International Conference held at Stockholm last year, with the view of making authoritative determinations of the constants used in reducing observations of the physical and chemical conditions of sea-water in different parts of the globe.

Dr. Knudsen reports that the work of obtaining samples of water from different regions has been completed, except with regard to those from the East Greenland polar current, the northern part of the Baltic, and the Indian ocean, which it is hoped will be received in about a month's time. The samples have been collected in 6-litre bottles, prepared by standing full of hot water for a month before use. Dr. Knudsen and his assistants began preliminary work in September last, and since May the regular analyses of samples have been carried on by himself, two chemists, and three physicists. The results obtained so far indicate that the methods employed are adequate in scope and precision, and sufficient progress has been made to justify the expectation that the work will be completed and published within the time arranged by the Stockholm committee.

On Tuesday, September 11, a paper was read by Mr. G. G. Chisholm on "Some consequences that may be anticipated from Development of the Resources of China by modern methods." He pointed out that the peculiarity of the position of China is this, that it is the one region in the world with all the means for industrial development on a gigantic scale that remains to be opened up. In the past thirty or forty years we have chiefly seen the opening up of new countries or old countries without great resources for industrial development.

Among the consequences that may be anticipated from the opening up of China, he noted—

- "1. A rise in prices in China, especially in the industrial regions.
- "2. The creation of a demand for food-stuffs not likely to be supplied by China itself: a demand which, in itself, will be one of the most powerful causes contributing to maintain the rise in prices.
- "3. The imparting of a great stimulus to the food-producing regions most favourably situated for meeting this demand, more particularly

Manchuria, Siberia, and western North America, probably the Pacific States of North America to a greater extent than Canada.

"4. Perhaps the most important of all, the creation of a tendency to a gradual but prolonged rise in wheat and other grain prices all the world over, reversing the process that has been going on since about 1870 in consequence of the successive opening up of new countries."

Mr. E. Heawood read a paper on the "Commercial Resources of Tropical Africa," in which he examined the causes of the present small commercial movement of that region; and, by a comparison with Brazil and other tropical countries, arrived at the conclusion that the future of Tropical Africa depends on the development of its agricultural products.

Mr. Vaughan Cornish read a paper on "Snow-ripples and Sastrugi," illustrated by a number of interesting photographs taken last winter in Scotland. This paper is preliminary to a fuller study of the wave-forms of snow surfaces to be carried out in colder regions.

Mr. E. G. Ravenstein brought forward an account of his researches on the geographical distribution of relative humidity, illustrated by a series of new maps. It is hoped that the complete paper may ultimately appear in this *Journal*.

Mr. J. E. Marr read a short but important paper on the peculiar form of isolated hill known from its popular Welsh name as a Moel. This paper will be published in a subsequent number of the *Journal*.

The last paper submitted to the section was an account of the "Pettersson-Nansen Insulating Water-bottle," by Dr. H. R. Mill, who also exhibited the apparatus in action at the museum which was provided in connection with the sections. An illustrated description of the water-bottle will be published in these pages.

Many important papers bearing closely on geography were read in other sections. In Section A, the subsection of Meteorology, which met on Monday, had to consider a very important paper by Captain Campbell Hepworth, on the "Weather of the North Atlantic Ocean in the Winter of 1898-99." The weather of the period was of an unusually tempestuous character, and the stormy seas were associated with abnormal warmth over Europe, and equally abnormal cold over North America.

The age of the Earth was considered by Prof. J. Joly in Section C, his estimates being based on the amount of sodium salts in solution in the sea. Mr. Harmer read a suggestive paper to the same section on the light which may be thrown on the climate of interglacial and glacial periods by considering the effect of the distribution of atmospheric pressure which may be deduced from the probable arrangement of land and sea at the periods in question.

Mr. R. D. Oldham pointed out in a short paper that already the new coast-line of Thirlmere, formed by raising the level of the lake in 1895,

is beginning to assume the usual outlines of a mature lake-shore in consequence of wave-action.

Finally we must notice the action taken by all the sections in submitting to the Council of the Association for its consideration a proposal to create a new section to deal with questions directly regarding education.

POLITICAL GEOGRAPHY AND THE EMPIRE.*

By Sir GEORGE S. ROBERTSON, K.C.S.I.

WHEN the British Association for the Advancement of Science honoured me with an invitation to preside over this Section, I accepted the distinction, thoughtfully and with sincere gratification. The selection as your President at Bradford, this great and interesting centre of commercial energy, of a student of political movements who was also deeply interested in the science of geography, seemed to point suggestively to a particular branch of our subject as appropriate for an opening address. This consideration, and, to my thinking, the fitness of the occasion, led me to believe that the British Empire itself was a very proper subject for such reflections as could be compressed within the limits of an inaugural Presidential Address. Many of my predecessors have eloquently and wisely dealt with various topics of admitted geographical rectitude—with geography in its more strictly scientific study, with its nature and its purview, with its recent progress, and with the all-important question of how it could be best taught methodically, and how most profitably it might be studied. In dealing with the important practical application of our science to the facts of national life—political geography—I feel that perhaps a word of explanation is necessary. Pure geography, with its placid aloofness and its far-stretching outlook, combined sometimes with a too rigid devotion to the facts and conclusions of strict geographical research, is apt to incline many scientific minds to an admirable quiet-eyed cosmopolitanism—the cosmopolitanism of the cloistered college or the lecture theatre. It perhaps also at times has a tendency to create in purely academic students a feeling of half disdain or of amicable irritability against those who love the science for its political and social suggestiveness and elucidations. Thus there is a possible danger that geographers of high intellectual calibre, with enthusiasms entirely scholarly, may come to underrate nationality and to look upon the world and mankind as the units, and upon people and confederacies and amalgamations merely as specific instances of the general type. We know that geography is often looked upon as the science of foreign countries more especially. Such mental confusion is undoubtedly less common than it was, yet it still influences, unconsciously, the minds of many people. It is well not to forget this curious fact, and to point out, as if it required emphasizing, that there is nothing foreign to geographical thought in the association of geography and patriotism, and that the home country is worthy of careful study, particularly when, as with us, our home country is not Yorkshire, nor England, nor the United Kingdom, but the whole British Empire. That is my justification and my apology for taking political geography and the British Empire as my subject, if justification and apology seem to any one to be necessary. To the generous hearts of our distinguished foreign visitors, who honour

* Presidential Address to the Geographical Section, British Association, Bradford, 1900.

us quite as much as they delight us by their presence, I am sure of my appeal. Every true man loves his own country the best in the world. That beautifying love of country does not require him to be ignorant of or to hate other countries. The community of the civilized nations, no longer to be described as Christendom even, for Japan has been received into it, is a mighty fact in geography no less than in politics. To love mankind one must begin by loving individuals; before attaining to true cosmopolitanism one must first be patriotic.

Now, besides dealing with the topography of the globe, geography considers also the collective distribution of all animal, vegetable, and mineral productions which are found upon its surface. The aspect of the science which deals with man's environment, and with those influences which mould his national character and compel his social as well as his political organization, is profoundly interesting intrinsically and of enormous practical usefulness when rightly applied. Given the minute topography of a country, a complete description of its surface features, its rivers, mountains, plains, and boundaries, a full account of its vegetable and mineral resources, a knowledge of its climatic variations, we have at once disclosed to us the scene where we may study with something like clearness man's procession through the ages. Many of the secrets of human action in the past are explained by the land-forms of the globe, while existing social conditions and social organizations can often thereby be intelligently examined and understood. Persistent national characteristics are often easy to explain from such considerations. For instance, the doggedness of the Dutch river-population, caused very greatly by a perpetual struggle against the sea, or the commercial carrier-instinct of the Norwegians, those northern folk born in a country which is all sea-coast of countless indentations. Having few products to barter, the Norwegians hire themselves to transport the merchandise of other peoples. We British also were obviously predestined to isolation and insularity, when perhaps in the human period the Thames ceased to be a tributary of the Rhine. Our Irish fellow-countrymen were similarly fated for all time to lead a separate, special, and national life apart from our own, when at a still earlier period, geologically, the Irish channel was formed.

Such large-scale facts are not to be overlooked; there are others, however, of varying degrees of prominence. Some merely require to be interpreted thoughtfully, while others, after diligent study, may still remain dubious and matter for speculation. Geography is the true basis of historical investigation and the elucidation of contemporary movements. At the present time great social and political changes are occurring throughout the world—in Europe, Asia, Africa, and America, and in the islands of the great seas. These changes are absolutely dependent upon the physical peculiarities of the different lands acting upon generations of men during a prolonged period of time. As a consequence of certain soils, geographical characteristics, and climates, we notice how harsh surroundings have disciplined some races to hardiness and strenuous industry, accompanied by keen commercial activity, which is itself both a result of increasing population and the cause of still greater overcrowding. Then we see other people at first sight more happily circumstanced. With them the struggle to live is less ferocious; their food is found with little toil. But we perceive that the outcome of generations of Nature's favouritism has been to leave them less forceful and less ingenious in the never-ending warfare of existence. By comparison they grow feeble of defence against the hungrier nations, ravenous for provender. Man for ever preys upon his own kind, and an easy life in bland surroundings induces a flabbiness which is powerless against the iron training of harsh latitudes, or against the fierce energy and the virile strength produced by hereditary wrestling with unkindly ground.

The discovery of America and Vasco da Gama's voyage round the Cape originated movements and brought into play those subtle influences of foreign lands upon alien sojourners, and through them upon their distant kindred, which alter the course of history and modify national manners and perhaps national characteristics also. The colonization of territories in the temperate zone by European Governments, separated by vast ocean-spaces from their offshoots, has given origin to new and distinct nations different from the parent stock in modes of thought and in ways of life, a result due mainly, no doubt, to local physical conditions, but in part also, if only in part, to detachment, to complete and actual severance from the mother country. This brings us to that most interesting and important topic, geographically speaking, of Distance, an aspect of our science which is of the utmost concern to traders and to statesmen; indeed, an eminent German geographer defines geography as the Science of Distances. To this subject of Distance I wish in particular to direct your attention, and especially to its bearings upon the British Empire.

The British Empire is equal in size to four Europes, while its population approximates four hundred millions. Although that may seem a somewhat grandiloquent method of description, it is a fairly accurate statement of fact. Still more interesting to us is another truth—that outside of these islands we have some ten millions of white-skinned English-speaking fellow-subjects. These islands are scarcely more than one-hundredth part of the whole Empire, although we count as four-fifths of its white population; of the total number of the Queen's subjects we are, however, no more than a tenth.

"British Empire" is somewhat of a misnomer, just as the North American and Australian Colonies were never colonies at all in the classical sense of the word. For the colonies are not independent of the mother country. An empire, again, really means a number of subject peoples brought together, and at first held together, by force. India is an empire, for instance. Some new title or phrase would have to be invented to describe accurately all the possessions of the British Crown from the Government of India through all possible grades of more or less direct control until we come to some colony with representative institutions, and thence to the great commonwealths with responsible legislators and responsible cabinets. Happily, however, there is no need now for any novel designation. The style "British Empire" has become in time of stress a rallying cry for all the Queen's subjects, and the term has been sanctified by the noble eager devotion shown to her Majesty, both as a beloved and venerated constitutional sovereign, and as the common bond of unity between those great self-governing daughter-nations which we in the past were accustomed to speak of as "our colonies." Consequently "British Empire" has henceforward a clearly defined, a distinct, a national significance, just as Imperialism has a special and peculiar meaning to all of us. We understand by "British Empire" and by "British Imperialism" a confederacy of many lands under the rule of her Britannic Majesty. This confederacy is dominated by white peoples—Anglo-Saxons, Celts, French-Canadians, and others—knit together in most instances by the ties of blood relationship, but with equal if not greater closeness by common interests, an identical civilization, and a love of liberty, in addition to that dignified but enthusiastic acceptance already referred to, of the constitutional sovereignty of the same Queen. We may hope that generous democratic expansiveness and social assimilation will also in time detain willingly within the limits of this British confederacy of white peoples those other Christians and distant kindred of ours in South Africa who are at present so bitterly antagonistic.

Ruled and controlled under liberal ideals by the centre of authority, there are,

in addition, the great subject territories whose non-Christian population are less advanced in moral and material progress. They exhibit, indeed, every degree of backwardness, from the barbarism of the savagest tribesman to the intellectual but archaic civilization of ancient Asiatic nationalities.

Concerning the British Empire, and comparing it with other empires, ancient, recent, or now existing, its two most remarkable features are its prodigious and long-continued growth and the persistency of its power. It cannot to all seeming grow much larger, from lack of expansive possibility. But it is unprofitable to predict. Every step which has been taken in the way of extension, particularly of late years, has been against the wishes and in almost passionate opposition to the views of large sections of the people. Yet the process of enlargement has gone on continually, being often in actual despite of a Government, whose members find themselves powerless to prevent absorptions and concretions which they would gladly avoid. Objections to this perpetual growth of empire in territory, and to the resulting responsibility which we not altogether willingly accept, are unanswerable theoretically. The too heavy and continually increasing strain upon our military resources every one can appreciate. The limit in power of the strongest navy in the world is at least as obvious as the vital necessity that our Navy be largely and ungrudgingly strengthened. Naturally the cry of cautious patriotic men is the same now that it has always been—"Consolidate before you step farther." In India, owing to conscientious and strenuous opposition to every suggestion of expansion and to the almost violent form which that opposition often took, our progress has been on the whole slow and comparatively safe. We have (I, of course, avoid all allusion to very recent policy) as a rule consolidated, strengthened ourselves, and made our ground sure before another advance. But there is a general impression that in other parts of the world we have been hastily and unfortunately acquisitive, whether we could help it or not; that the new provinces, districts, and protectorates are some of them weak to fluidity; that the great and unprecedented growth of the Empire has led to a stretching and thinning of its holding links, which are overstrained by the weight of unwieldy extension and far beyond the help of a protecting hand. I hope to be able to show that in some important respects this suspicion is not altogether true; that science, human ingenuity, and racial energy have given us some compensations; and that it is not paradoxical nor incorrect to say that our recent enormous growth of empire has been everywhere accompanied by a remarkable shrinkage of distances—by quicker and closer intercommunication of all its parts one with another and with the heart centre. In short, the British Empire, in spite of its seemingly reckless outspread, its sometimes cloudy boundaries, its almost vague and apparently meaningless growth, is at the present day more braced together, more manageable, and more vigorous as a complete organization than it was sixty years ago. The difference between its actual extent in the last year of the century and its size at the date of the Queen's accession can be estimated by a glance at a remarkable series of maps published in the 'Statesman's Year-book for 1897,' while since 1897, and at this instant as we all know well, its mighty bulk is being still further increased.

The world as a whole has strangely contracted owing to a bewildering increase in lines of communication, to our more detailed geographical knowledge, to the formation of new harbours, the extension of railways, the increased speed and the increased number of steamships, and the greatly augmented carrying power of great sailing vessels built of steel. Then, hardly second in importance to these influences are the great land lines and the sea-cables, the postal improvements, the telephones, and, perhaps we may soon add, the proved commercial utility of

wireless telegraphy. This universal time-diminution in verbal and personal contact has brought the colonies, our dependencies, protectorates, and our dependencies of dependencies, closer to each other and all of them nearer still to us. Measured by *time-distance*, which is the controller of the merchant and the cabinet minister just as much as of the soldier, the world has indeed wonderfully contracted, and with this lessening the dominions of the Queen have been rapidly consolidating. Nor is this powerful influence by any means exhausted. In the near future we may anticipate equally remarkable improvements of a like kind, especially in railways, telegraph lines and deep-sea cables, and in other scientific discoveries for transmitting man's messages through water, in the air, or perhaps by the vibrations of the earth. For us particularly, railway schemes of expansion must be mainly relied upon to open up and to connect distant parts of the Empire. Our true and only trustworthy road of intercommunication between the heart of the Empire and its limits must always be the sea. For general trade purposes, such as the convenience of business travellers, all continental lines and all the great projected railways will be helpful, whatever nation controls them; but our certain security is the sea, the sea which protects us, which has taught us to be an Imperial people. If we ever forget that, there may be a calamitous awakening. We must not be persuaded to build—or at any rate to place reliance upon—land roads or railways through regions inhabited by tribes and peoples over whom we have not complete military as well as political control. Persian, Arabian, North African railway projects are happily rarely heard of now. As national enterprises they never were and never could be practicable, or otherwise than dangerous mistakes. We are a world-power solely because of our worship and because of our command of the sea. In the future also we shall remain a world-power only so long as we hold command of the sea in the fullest sense of the term, not merely by the force and efficiency of the fighting Navy, but by the excellence and the perfecting of our mercantile marine, by increasing its magnitude, carrying power, and speed, and by anxiously attending to its recruitment by British sailors. We must not attempt to overtax our resources to guard railway lines through foreign semi-civilized or savage countries by exported or local armies. A heavy land responsibility lies upon us already. Under a little more we might be easily over-weighted and crushed down. We must concentrate all our surplus energies upon our sea communications. Therefore the railway lines which I spoke of as helping to consolidate the Empire in the near future are those only which are projected or are being built in the various colonies and dependencies, lines to distribute and collect, to connect provinces, and feed harbours. The mighty Canadian Pacific Railway is unique in the Empire. It not only complies with all these requirements, but in addition it provides to Australia and the Eastern dependencies an alternative road, convenient and safe. As I said before, all railways, wherever built, will probably help us directly or indirectly in the long run, provided we are never committed to the protection of any one of them outside of our own boundaries.

And what has been said about railways applies, with obvious modifications, to telegraph lines and to maritime cables. The more general the extension of these, and the more numerous they become, the greater benefit will there be to this country in its double capacity as the greatest trader and the greatest carrier of merchandise in the world; while the actual equivalent to a diminution of time-distance in travelling is to be found in the instantaneous verbal message which can be despatched to the most distant point of the Empire. But we ought certainly to join all the shores of the Queen's dominions by sea-cables completely controlled by British authority. To rely upon connection between our own cables through

telegraph systems stretching across foreign countries, however friendly, or to permit the ends of these sentient nerves of the Empire to emerge upon shores which might possibly become an enemy's country, is dangerous to the point of recklessness, that parent of disaster. As a melancholy instance of my meaning, it is only necessary for us to remember the Pekin catastrophe—how we suffered from those dreadful intervals of dead silence, when we could not even communicate directly with our own naval officers at Taku, or with any one beyond Shanghai, although we have in our possession a place of arms at Wei-hai-Wei, upon the Gulf of Pechili. It is obvious that we ought to have an all-British cable for pure strategic reasons as far as Wei-hai-Wei, our permanent military outpost on the mainland.

To give some suggestion of the increased facilities for carrying merchandise, for conveying passengers quickly about the world, and for the sending of messages to all parts of the Earth, a few, a very few, salient facts may be quoted about ships—sailing-ships and steam-vessels—and about telegraphs and cables.

In 1870 there were no more than ten British sailing-ships which exceeded or reached two thousand tons burden. In 1892 the yards on the Clyde alone launched forty-six steel sailing-ships which averaged two thousand tons each. In 1895 the number of large steel sailing-ships being built in the United Kingdom was down to twenty-three, and, speaking generally, it is inevitable that sailing-vessels must give way to ocean steamships for most kinds of cargo—cattle, coals, wool, grain, oil, and everything else.

Now let us turn to the results in shortening journeys accomplished by the progress made in the construction and in the driving machinery of steamships within the last forty years, which has especially been fruitful in such improvements.

During this century the six months' voyage round the Cape to India became a forty and then a thirty days' journey by what was known as the overland route for mails and passengers through Egypt. By degrees it had become shorter still by the railway extensions on the Continent, and by the unbroken steamship passage through the Suez canal, until now the mails and hurrying travellers may reach London in twelve or fourteen days after leaving Bombay; and the great liners of the P. & O. Company can arrive in the Thames eight days later. This famous corporation, after her Majesty had been reigning nearly ten years, possessed only fourteen ships, with an aggregate of 14,600 tons. Now it owns a princely fleet of fifty-three ocean steamers, with a total capacity of 142,320 tons. Practically the voyage to India in her Majesty's reign had been diminished by one-half at least.

Since the Queen's accession the passage between the British Isles and the Commonwealth of Australia has grown shorter, from the ninety days taken by the sailing-clippers to the fifty-three days occupied by Brunel's *Great Britain*. At the present time it lasts from thirty to thirty-five days by the Suez canal route, while it has been finished in as little as twenty-eight days. Australia is consequently only half as far away, in time, as it was; while, if the Suez canal were closed for any reason, we have at our disposal, in addition to the Cape route with its quick steamers, which is linked to us by the Pacific ocean road, the splendid service of that empire-consolidator, the Canadian Pacific Railway.

The important part played by the Suez canal in this connection will be discussed a little later. Now I am merely indicating by a few well-known facts the diminution of distance by the improvements which have been made in the ships themselves and in their propelling machines.

Across the Atlantic the rapidity of travelling and the general average speed of

all cargo steamers have increased remarkably. Very interesting statistics on this point were given to the British Association for the advancement of science last year, at Dover, by Sir William White, in the Presidential Address of Section G. We may say, without repeating details, that during the last half of the nineteenth century the breadth of the Atlantic has practically been diminished one-half.

In 1857 the Union Company contracted to carry mails in thirty-seven days to the Cape. Now the contract time is nineteen days. This again diminishes the distance by one-half. As an instance of the remarkable change which has been made in steamships within forty years, it may be mentioned that the first *Norman* of the Union Company took forty-two days to reach the Cape, while the present *Norman* has covered the journey in fourteen days twenty-one hours. I need not specify particularly the equivalent acceleration of speed upon other great steamship lines. All our sea distances have been shortened fifty to sixty per cent. in an identical way.

It is not too bold to predict that the Atlantic, from Queenstown to New York, will, before long, be steamed in less than four days. The question has resolved itself simply into this—will it pay shipowners to burn so much coal as to ensure these rushing journeys before a cheaper substitute for coal is found? We know that a torpedo-destroyer has been driven through the water at the rate of forty-three miles an hour by the use of the turbo-motor instead of reciprocating engines. Consequently an enormous increase in the present speed of the great Atlantic liners is certain if the new system can be applied to large vessels. By such very swift steamers, and by the example they will set to all established and competing steamship companies, the journey to Canada, and subsequently to all other parts of the Empire, will be continually quickened, until predictions which would now sound extravagant will in a few years be simple everyday facts.

We must turn next to the subject of telegraphic communication, especially as it relates to the British Empire.

The mazes of land-lines, and of sea and ocean cables, are too numerous and intricate to be described in detail. Also the general effect of this means of bringing distant peoples together, and its transcendent importance for political, strategic, and trading purposes, need not be too much insisted upon in this place, so obvious must they be to every one. Yet, great as has been its power and advantage in all of those directions in the past, it is certain that still greater development and still greater service to the world will follow in the future even from existing systems, not to speak of their certain and enormous possibilities of growth. In the celerity of the actual despatch of a message we need not ask for much improvement. Lightning speed will be probably sufficient for our go-ahead children of the twentieth century. But where we may expect and shall undoubtedly get increased success, is in multiplied facilities for sending telegrams all over the Earth, and in widening their usefulness and convenience to all ranks and sections of the community. To obtain these necessary advantages there are two requisites—first, a great and general cheapening of tariffs, and, as a certain consequence of such reduced charges, a duplication, or even a quadrupling, of many of the present cables to prevent blocking; and, secondly, an indefinite extension of both lines and cables everywhere. Progress in submarine telegraphy undoubtedly means a lessening in the price of service and a firmer control by the State, as an obvious corollary to the large help to the companies already given by the general taxpayer, quite as much as it means those scientific inventions and scientific discoveries which the coming years have in store for us. At the present time the charges are

high, ridiculously so as regards India, and the use of the great cables is very often beyond the power of the small capitalist and the trader of

the middle sort. Yet certain and early news is of supreme importance to large numbers of both classes. Its absence hampers or stops business, while its price is too severe a tax upon average profits. This fact has led to the invention of ingenious and elaborate codes. They might possibly have been devised in any case; but there is no doubt that messages by code would be certainly expanded so as to prevent all possible ambiguity, if telegraphing to distant countries were not so costly. The spreading of land-lines and sea-cables about the Earth has gone on rapidly since 1870; to the extent that those already completed would seem even to be in advance of their requirement, if that requirement were to be measured by their full employment. Nevertheless, it is to be wished that new companies could be formed and new lines laid down to excite competition, and thereby to cheapen rates; or else that our Government should step in and regulate charges over subsidized British lines. For the power of the great telegraph corporations, by reason of their monetary resources, enables them to overcome ordinary rivalry and to treat public opinion with indifference. A general cheapening of rates has constantly been followed by increased profits, earned by the resulting augmentation of traffic, but it needs an enterprising directorate to face the necessary initial expenditure, except under pressure. Boldness and foresight in finance are naturally less prominent features in the management of the great telegraph companies than contentment with a high rate of interest on invested capital. All their energy and watchfulness are employed to crush competition rather than to extend their activities indefinitely. Moreover, money-making is their business, not Imperial statesmanship. If it were a question of the added security or the close coupling-up of the Empire (which are probably synonymous) on the one hand, and a loss of profit (however splendid the dividends might still remain) on the other, we know what would be the result of their deliberations.

Important as are the sea-cables for statesmen, for strategy, and for commerce, they are or will be equally important socially to keep up intimacy and swift intercourse between families half in Britain and half in India, for instance, or between friends and relations in these islands and in the great colonies. They might be made to give the sensation almost of actual contact, of holding the hand of your friend, of speaking directly to his heart. It is this interchange of personal news and private wishes, quite as much as the profound political and commercial aspects of lightning communication with all parts of the Empire, which will bind the Empire in bonds stronger than steel, easy as affection, to hold it together with unassailable power. Consequently the health and strength of the Empire depend very greatly upon a cheapening of telegraph charges. Doubtless a time will come when all our main cables of the first importance will be in the hands of Government, when they will only touch upon British territory, and when they will be all adequately protected from an enemy. Those are truly Imperialistic and patriotic aspirations. But we must never forget the grand part in bringing together, within whispering distance as it were, the different parts of the world, and consequently of our world-wide Empire, which has been taken in the past by such Napoleonic organizers as the late Sir John Pender. It is to him and to such men as he that we owe those splendid beginnings which by means of vital reflexes from the nerve-centre of the Empire have helped to fire our white fellow-subjects all over the globe with a loftier patriotism and with new, brave, and broader ideals of nationality.

Coincident with the opening of the Suez canal in 1869 the liveliest interest began to be taken in sea-cables, and a master mind perceived their commercial possibilities. Before that time the success of the constructing companies had not been great. Sir John Pender then founded the famous Eastern Telegraph

Company by the amalgamation of four existing lines, which had together laid down 8500 miles of sea-cables, besides erecting land-lines also. A year later, in 1873, from three other companies he formed the Eastern Extension Australasia and China Telegraph Company, which jointly possessed 5200 miles of submarine lines. From that date the extension of electric communication to all parts of the earth, over wild as well as over civilized countries, and beneath the salt water, has only been equalled by their average remunerativeness. Now there are 175,000 miles of submerged cables alone, of which this country owns no less than 113,000 miles. The history of some of these cables is full of interest, and might attract the delighted attention of the lover of picturesque romance no less than of the student of commercial geography. It also supplies suggestions and many facts, both to the physical geographer and to the student of seismic phenomena. Science has taught the companies to economize time, labour, and material in cable-laying operations, as well as how to improve the working instruments. Human ingenuity, business perception, and organizing power have shown once more their startling possibilities when directed and controlled by cool, clear-eyed intelligence combined with general mental capacity.

It is only necessary to reaffirm, for the reasons already given, the national, the imperial, the commonwealth requirement for cheap telegraphy, and the profound necessity there is, both strategically and politically, for complete Government control by purchase, guarantee, or other equitable means over main cables which connect Great Britain with her daughter states, her Indian empire, and her dependencies. Our communications with our own folk must be independent of private companies and completely independent of all foreign nations.

All the details which I have given are illustrative of man's successful energy and of his progressive ingenuity in enslaving the great forces of the earth to diminish distance, to shorten world-journeys, and to speed world-messages. Another human achievement, the piercing by Lesseps of the Suez isthmus, has had remarkable consequences. It had been talked of in England centuries ago. Christopher Marlowe makes Tamerlane brag—

"And here, not far from Alexandria,
Whereas the Tyrrhene and the Red Sea meet,
Being distant less than full a hundred leagues,
I meant to cut a channel to them both,
That men might quickly sail to India."

The illustrious French engineer solved one great problem in 1869, only to originate others which are of profound importance to commercial geography—and of the British Empire most of all. The Suez canal has brought India and the Australasian Commonwealth wonderfully near to our shores. It has greatly diminished many time-distances, but why has it not injured our Eastern trade? Also is there any danger or menace of danger to that trade? From the very beginnings of the great commerce, the Eastern trade has enriched every nation which obtained its chief share. It has been the seed of the bitterest animosities. It alienated Dutch and English, blood relations, co-religionists, co-reformers, into implacable resentment, and bitter has the retribution been. On the other hand, it brought into temporary alliance such strange bedfellows as the Turks of the sixteenth century and the Venetians. At the present day what international jealousies and heartburnings has the same rivalry not fostered! For all the trading peoples know how vital is that traffic.

In the earliest days of commercial venturings the Eastern trade focussed at Alexandria, afterwards at Constantinople and the Italian "factory" stations of the

Eastern Mediterranean. Barbarous upheavals in Central Asia interrupted the current at times, but only as temporary dams. Then came Vasco da Gama's voyage round the Cape and its sequels—the diversion of the rich merchandise of the Orient from the Italian ports and from the Eastern Mediterranean to the sea-coast cities of the Atlantic. Out of the relentless scramble of the Atlantic nations for this, the grandest of the trader's prizes, the English came out bloodily triumphant, and the British have remained the dominant shippers ever since. But when the Suez canal was trenched through, a geographical reversal followed: the merchant's chief path may be said to have left the Cape circuit and to have regained the old line, with immensely added facilities, to debouch upon the Eastern Mediterranean. Why has it not affected us more profoundly? Are not geographical canons outraged by the great steamers passing by the French and Italian ports to find distributing centres in these islands? I think that theoretically it is so, even admitting that the foreign harbours are more difficult than ours. Practically only a few industries have suffered; the volume of our trade has increased greatly, and it still remains easily pre-eminent. One of the chief explanations I believe to be this: Geographical considerations were defeated, for the time at any rate, by the excellence of our banking system when the Suez canal was opened. The wealth of the country, then as now, instead of being separated and divided into isolated patches, was accumulated in the hands of bankers and was readily and easily available for commercial enterprises. So the necessary steamers—huge, and of special line—were built at once by our companies and launched into the valuable Eastern trade before their rivals could begin to stir. This country had the invaluable help of its monetary facilities. Wealthy shipping corporations, once fully organized and successful, have great power, by reason of their reserves and resources, to hustle and to ride off the attacks of weaker and less-experienced competitors. Supposing this great change had but just occurred—our advantages, though still distinct, would have been less remarkable. And in the future international trade jealousy will be keener and the competition even more severe. We must not forget that our geographical position is no longer in our favour for steamships plying from the East, and, as in the immediate past, we must throw away no chances, but seek to make up for that admitted defect by defending and supporting that admirable system—our national banking system—which has carried us over seemingly insurmountable obstructions to brave trade triumphs.

The general considerations which I have named might lead to the inference that actual geographical disadvantages, in trade competition for instance, may sometimes be conquered by man's resourcefulness and energy. Within obvious limitations that is certainly true. At places, as we know, the borderland between geography and many of the natural sciences is often vague and confusedly interlaced. So perhaps also with mechanical and economic science our boundaries at certain spots overlap. Quick steamers, far-reaching telegraph lines, and the piercing of isthmuses by ship canals may at the first glance appear outside the purview of the geographer. Yet from that particular aspect of geography which I have already spoken of as the Science of Distances we perceive how relevant they are, how worthy of study. Truly ours is a very catholic science, and we have seen how even the comparative value of national banking systems may help to explain seeming geographical inconsistencies, to reconcile facts with possibly unexpected results, and to show how the human element modifies, perhaps, the strictly logical conclusions of the geographer intent upon physical conditions alone. It is for the statesman and the philosopher to speculate upon the character and the permanency of such influences. Our success as an Empire will probably

depend for its continuance upon a high level of national sagacity, watchfulness, and resource, to make up for certain disadvantages, as I think, of our geographical position since the cutting of the Suez canal; and it will also depend upon the comprehensive and intelligent study of all branches of geography, not the least important of which to my view is the Science of Distances—the science of the merchant, the statesman, and the strategist.

THE ORIGIN OF LAND-FORMS THROUGH CRUST-TORSION.

By M. M. OGILVIE GORDON, D.Sc., Ph.D., LL.D.

CRUST-TORSION has already been recognized as a mode of crust-deformation associated with the superposition of different movements upon one another, either simultaneously or successively. But its appearances in the field had been referred more especially to cases of rectangular cross-movement, or, as some writers expressed it, to the action of end and side pressures.

In 1898, I demonstrated, by the field geology of Enneberg, that phenomena of crust-torsion were induced by *any combination of crust-pressures, not only by cross-movements crossing rectangularly, but also by cross-movements at any oblique angle.*

Without entering here into the original cause of crust-strains, it is within the experience of geologists and physicists that any deformation of a flexible sheet of material due to a lateral thrust or pressure will set up internal strains of warping traceable to some inequality in the strength of the material and to consequent local differences in the resistance offered to the deforming tangential strain.

The least complex case of differential movement can be illustrated by the behaviour of such a material as a wooden lath supported at both ends, and bent by being either loaded by a weight at the middle (Fig. 1), or by end thrusts directed along its length. As every one knows, the upper layers of the wood are subjected to compression, and the lower to tension; consequently we find that the uppermost surface, AB, of the lath is shortened in length, and the lowermost, CD, is increased in length. Here the differential movements of the layers of a uniform material have given rise to a decrease of surface at one place, and an increase of surface at another.

The deformation of such a lath would correspond to the formation of a trough. A similarly deformed lath would, if inverted, correspond to the formation of an arch.

Lines such as AC and BD, which were originally vertical, have got deviated into such a position that they would, if produced, meet in such a point as O (Fig. 2). Similarly, AC and EF would, if produced, meet in P. In short, points which were arranged in vertical parallel lines before the deformation of the lath would, after deformation, be arranged in lines which meet radially in such centres as O or P; such lines have therefore undergone a movement of rotation in a vertical plane. These laths are deformed in a vertical plane because they are weakest in that plane.

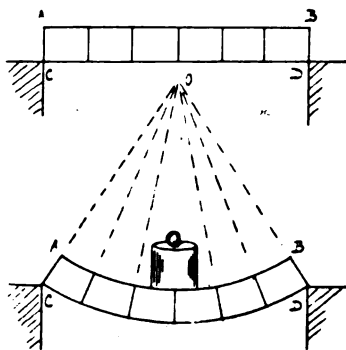


FIG. 1.—BENDING AND WARPING OF A LATH LOADED AT THE CENTRE WITH A WEIGHT.

Continuing the lath illustration, suppose a lath turned on its side. Then, if its ends were subjected to compression, the lath would be deformed, but this time in a horizontal plane, because it is weakest in this direction. Such lines as AC and BD, which were horizontal and parallel before deformation, would get deviated in a horizontal plane into such a position that they would, if produced, meet in a point like O. Similarly AC and EF would, after deformation, meet in a point like P.

If these two movements, the one a turn in the vertical and the other a turn in a horizontal plane, were combined, such lines as AC and BD would describe cones, and each point in these lines would be twisted or move in a spiral. When a sheet of material is built up of layers heterogeneous both in vertical succession and in horizontal extension, it is most certainly unequally strong in different directions. Whence, if subjected to horizontal compression in any one direction, the general movement of any one part of that sheet will consist of a combination of a horizontal and vertical turning movement—that is, *motion in a spiral*.

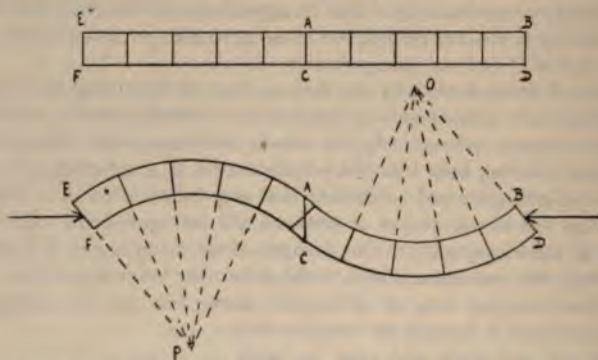


FIG. 2.—BENDING AND WARPING OF A LATH SUBJECTED TO END COMPRESSIONS.

Since the Earth's crust is everywhere heterogeneous, the spiral is the fundamental mode of movement in the crust. Observe that this is independently of any repetition of folding. When, however, repetition of folding *does* take place, increased complexity in the spiral movements ensues. Any subsequent differential movements may be influenced by the development of local places of weakness due to a primary series of folds, thus rendering such movements more marked than would arise from heterogeneity alone.

The older system of folding and fracture may be regarded as a floor with lines and areas of weakness; any material which is laid down on the floor, is really laid on a foundation with strong and weak places. If now a new set of forces come into operation, the structure, consisting of floor and material resting on it, will yield readily at these places of weakness. Thus the material which has been laid down in the interval between the first and second foldings will have its movements determined by both foldings.

It is clear that in a region like the Alps, which has in its separate parts suffered from repeated folding movements, the complications due to cross-movements must be very involved.

In Enneberg, in South Tyrol, I regard the torsional phenomena as prominently developed, both because in that area the layers of the Permo-Triassic sheet of deposits offered strong contrasts in strength, and because the whole post-Permian series had been laid down upon an already folded and fractured floor, namely, that of the

Permian Alps. I showed in Enneberg that the original horizontal, vertical, or oblique limits between groups of softer deposits and more rigid calcareous or dolomitic rock-masses had been pre-eminently planes of local differential movements during the regional Alpine movements, and were still, in many places, characterized by the continuance of crust-fractures, or by frequent surface-slips. Accordingly, the original distribution of the more rigid and the more plastic deposits was a matter of the utmost significance for the subsequent history of deformation and denudation.

The geological succession of the Upper Triassic deposits is remarkable in the Eastern Alps for the very great differences in the lithological character of contemporaneous sediments, and in the faunas comprised within them. The particular development within each geographical district is termed a particular local "facies," and the geographical district is termed a "province." In Enneberg, the local facies of deposits in the earlier eras of Upper Trias comprises a mixed series of volcanic tuffs and marls, shales, sandstones, together with limestone and Schlern dolomite. On the other hand, the facies of the contemporaneous deposits south of Enneberg is almost wholly calcareous or dolomitic, and is known as the "Schlern dolomite" facies in contradistinction to the tufaceous facies of Enneberg. Both these facies pass upward into various local developments of "Raibl" marls and shales, succeeded by the highest horizons of the Upper Trias, namely Dachstein dolomite. All groups of Triassic rock, both the less yielding and the more yielding, varied rapidly in thickness in Enneberg.

Another important intermixed series of deposits is the Liassic group, succeeding the massive and less yielding Dachstein dolomite of Upper Trias. During the post-Jurassic regional movements of Alpine upheaval, the harder masses exerted subordinate pressures on the softer. "The harder rocks of Schlern and Dachstein dolomite have sometimes been pushed into new positions over the slipping substratum of earthy rocks without in themselves undergoing much relative change of position or perceptible evidence of strain, except where complications are introduced by minor thrusting and faulting along the main planes" (*Geol. Mag.*, 1894, "Coral in the Dolomites").

Local differential movements had also been set up between Enneberg and the adjacent area on the south, which exhibited the calcareo-dolomitic facies, the northern area having sunk relatively to the southern. The mixed tufaceous facies of Enneberg extends along the north of an ancient zone of fracture, in which considerable masses of lava and tuff occur, partially of Triassic age, partially of the younger ages of Alpine movements. In addition to the existence of an old zone of crust-movement, the marked differences of the Triassic deposits on the north and on the south of it tended to make these contiguous areas of deposit act in a measure independently of one another during any future oncoming of movement.

The above examples of the modifying influence that may be exerted upon a regional movement by local strains due to local conditions are furnished upon personal evidence. A third example may be selected from the general literature of the Dolomites. It shows how the presence of the Permian quartz porphyry in the Bozen area affected adjacent areas during Alpine upheaval.

The general stratigraphical relations of the quartz porphyry are thus described by Prof. Suess: "Towards the south and towards the north, older formations appear below the porphyry; towards the east and towards the west, the porphyry descends below younger formations. . . . The younger deposits resting on the porphyry on the east side, form that part of South Tyrol famous for the beauty of its landscape, and which has been somewhat erroneously termed the "Dolomites." The western edge descends more steeply below a long and narrow fault-block of

deposits, assuming in some parts the form of a flexure overcast towards the west. The fault-block of deposited material embraces *the whole succession from Permian to Middle Tertiary*, and is lowered into a great crust-trough between the flexure on the western edge of the porphyry and the Judicarian fault-line" ('Antlitz der Erde,' Bd. i. p. 330: the italics are mine).

The position of the porphyry relative to the older strata on the north and south indicates compression of this area from north and south, a compression which was shared by the adjoining areas of the Etsch valley and the Dolomites. On the other hand, the position of the porphyry relative to the younger strata on the east and west shows that differential movements took place locally in cross-directions at the limits between the hard porphyry mass and other less resisting rock-material next to it.

Hence this example is in harmony with one of the writer's conclusions in Eneberg, that local torsional effects arising from cross-movements between dissimilar masses of strata or unequally yielding areas have, in the Alps, been superinduced upon fundamental east-and-west or "regional" axes of deformation. It is a separate question in how far the local strains were synchronous with the more general movement, or if the local strains were earlier or later.

Such a question can only be decided on the merits of each individual case; in the case of the Bozen area, an index of the age of the cross-movements is given in the lowering of middle Tertiary strata within the trough west of the porphyry: since, at whatever time the local differential movements may have begun, they have been in progress since the deposition of middle Tertiary rocks. In the case of Eneberg, there is clear evidence that a general east-and-west folding and faulting of the strata has taken place subsequently to the deposition of all the Mesozoic horizons of rock exposed there. The whole series also shows the folding and dislocating effects of cross-strains, mainly from west-north-west and east-south-east, while the results of more local horizontal, oblique, and vertical differential movements are variously exhibited in the different horizons of rock. It follows that there has been in Eneberg compression and cross-compression. Upon mechanical principles, the resultant effect of superinduced strains is the same, whether the several strains develop simultaneously, or successively, or intermittently, and it has been explained above how superinduced cross-strains in different directions would inevitably cause resultant displacements in the same sense as would be effected by twisting or "torsion" of rock-layers and rock-particles.

It may probably be regarded as true of any wide region upheaved by a folding-movement and afterwards submerged, that old crust-forms and crust-fractures, especially such as allow occasional intrusion and outlet of volcanic material, are determining factors in the distribution of the subsequent deposits. They largely determine the irregularities of the sea-floor, the varying depths of adjacent basins, the local deflections of oceanic currents and the distribution of warmer and colder water, the wash of breakers, and other local conditions which influence the distribution of pelagic faunas (cf. Sir John Murray, *Deep-sea Fauna*, July, 1889). And in this way by local demarcation of lithological and faunal facies, local lithomorphoses having reference to other surface-forms are implied upon a region for all time.

With the occurring of another movement of upheaval from the same direction as the earlier movement, or from any other direction, the boundaries of facies laid down in that region during the previous ages of uproot are specially liable to become axes or centres of differential movements although the individual facies can only exert local modifying influences. Hence incidents of folding and faulting, of intrusion of granitic rock, of subaerial and submarine denudation associated with a

earlier upheaval are the basis directly and indirectly of subordinate or local systems of crust-strains which interfere with the main system of strains governing a later upheaval, and are concentrated along old depositional and structural limits.

During the progress of the new regional movement, the new axes of deformation determine new boundaries of facies, and these new boundaries of different deposits or of intrusive and sedimentary rocks offer additional planes of differential movement that take effect as the movement progresses.

For example, the Cretaceous epoch is regarded as the second great mountain-forming period in Alpine history, and during it both longitudinal and cross-faults are said to have been developed, more especially in the Eastern Alps. Austrian geologists are of opinion that the deposition of Upper Cretaceous rocks in certain parts of North Tyrol was localized in accordance with the previous development of important Cretaceous fault-lines, also that these faults were afterwards zones of marked deformation during the farther upheaval of the "limestone and dolomite" region of North Tyrol. This case offers analogy with certain points that I demonstrated in Enneberg, (1) in respect of the localization of facies in the vicinity of Triassic faults; (2) in respect of the tendency of any later movements in the same region to be influenced by the old lines of fault.

But still other agencies have to be considered besides these of sedimentation during the new movement. For as the Cretaceous and Tertiary lands emerged in the Alps, they were subject to the processes of denudation and to subsidiary movements of crust-adjustment following upon these. The complications of cross-movement were therefore bound to increase as the history of upheaval and denudation went on side by side, and the actual crust-forms shaped during the Cretaceous and Tertiary epochs could not be other than complex resultant forms, combining effects of differential movements accomplished in virtue both of older and newer boundaries of deposits, directions of crust-weakness, and influences of surface-erosion.

As early as 1894 I had pointed out that the Cretaceous-Tertiary movements only in so far followed the main lines of the Triassic movements, that they also crossed these at various angles. Further examination and mapping showed me that radiating dykes were associated with characteristic "bundles" of faults and with curvatures of the strike developed in the Cretaceous-Tertiary epochs. The complications corresponded in essential features to the structure which Prof. Lossen had worked out in the Harz, and had there attributed to torsional crust-movement. Many other complexities in Enneberg, such as the minor thrusting in oblique directions across a main overthrust, the disposition of the outcrops of rock-horizons in sigmoidal or S-shaped curves, and in whirl-shaped figures generally, the gradations of strike in diverging fault-blocks, the rapid variation in the angle of inclination of fault-planes, and frequent forking and intersection of faults, indicated a solution based upon principles of crust-torsion.

I then formulated certain definite principles of crust-torsion which seemed to explain the present complicated structural relations in Enneberg—the leading principle being that in Enneberg we have not a simple lateral thrust to deal with, but the resultant effects of different lateral thrusts differing in intensity and crossing one another.

It had been hitherto accepted in Alpine geological literature that the lateral pressure which led to the upheaval of the Alps in Cretaceous and Tertiary time came from one direction, mainly from the south, and caused upfolding of Alpine territories in a general system of east-and-west folds, associated with gigantic crust-creep of overthrust masses, more especially towards the north on the northern edge of the Central Alpine chain, and in less degree towards the south on the southern edge of the Alps; the whole structure had also been dislocated by

longitudinal and transverse faults, some of which were older, others younger, than the folds and overthrusts.

In agreement with this, I found that *all* the rock-deposits in the Alpine district which I examined had been subjected to compression from north and south, and folded in a general fundamental system of east-and-west folds. But I also found that this system had been crossed by a transverse or slightly oblique system of anticlines and synclines, and subjected to extreme deformation and distortion from cross-directions. The longitudinal folds had been steeply tilted, or "overcast," i.e. laid over into more horizontal positions, or fractured, and the parts carried into different oblique directions. Associated with the cross-compression new folds had formed, and overthrust masses had travelled in transverse and various oblique directions. Within the Dolomites, where I worked, I found



FIG. 5.—WEDGES OF LOWER AND MIDDLE TRIAS ABOVE THE PLANE OF OVERTHRUST IN RUCKENSTEIN VALLEY, VIEWED FROM THE SOUTH.

that in several cases overthrust slices had crept obliquely across the smaller folds and crumples of intensely-crushed underlain masses, which had been dragged out and tilted slantingly upon one another in wedge-like fragments, representing subsidiary overthrusts accompanying the major overthrust.

An example of such oblique shearing is given in the photograph of an outcrop in the "Ruchenstein" overthrust south of Innsbruck, in the Dolomites (Fig. 5), which is interesting also in showing igneous rock-material injected into these planes of fracture and shearing.

The photograph Fig. 4 shows a highly characteristic effect of cross-compression upon the dolomite rocks. The cliff in the photograph is composed of dolomitic strata which form part of a longitudinal arch, the strata being tilted so that the planes of bedding incline at an angle of about 30° to the north. Far more apparent than the planes of bedding are the planes of separation which cut

the bedding planes almost vertically, and extend in north-north-west—south-south-east direction, indicating the action of lateral pressures along east-north-east and west-south-west direction.

The photograph Fig. 5 represents a small part of the eastern transverse arch of the mountain massive of Sella, in Enneberg; this arch comprises several *transverse* folds and fractures, indicating the action of lateral pressures transversely across the east-and-west systems. The western transverse arch of Sella faces Langkofl mountain, so well known to climbers; it shows nearly undisturbed horizontal stratification, being part of a wide arch deeply cleft and jointed (Fig. 6).

These are only a few examples of the simpler observations that can be made on cross-movements in the Dolomites. The difficulty that attends the elucidation of the complex resultant system of folds and overthrusts is due to the presence of a



FIG. 4.—SLABS IN SCHLERN DOLOMITE ROCK, PRODUCED BY CROSS-PRESSURES: SPITZ-KOFL GROUP FROM GRÖDEN PASS.

network of fault-planes, highly inclined or vertical, that have dislocated the series of folds and overthrusts, and displaced them in vertical and horizontal senses. The Sella mountain has subsided in several "fault-blocks" since the epoch of overthrusting, so that in its case faulting and erosion have only left incomplete remnants of the structural forms that were assumed by the upper horizons of the rock-series in the Dolomites. It is therefore chiefly in the lower horizons of the series exposed in valleys and high meadowlands that we have to seek fulness of detail; both at Gröden pass and in Buchenstein valley convincing evidence may be observed of the action of differently directed movements in the course of Alpine upheaval (cf. "The Torsion Structure of the Dolomites," 1899, *Q.J.G.S.*).

The leading faults of adjustment are of wide extent, continuing beyond the limits of the district examined; several of these converge in the interesting "eruptive centre" of Predazzo. The faults associated with the local subsidences and surface-slips more especially attest the influence of local differences in the character of the contiguous rocks, *either those which were originally next one*

another, or those which had been brought by the previous complex movements of bending and thrusting into juxtaposition with one another. It would not be accurate to describe even the leading faults simply as a system of longitudinal faults crossed by transverse faults; they present varied arrangements in fault-bundles and fault-polygons, and, like the joints and the greater and finer separation-planes through the rock, intersect each other, or subdivide into forking branches of less importance.

The general effect of these adjusting movements in the Dolomites has been to depress the whole region, cutting it up into numerous fault-blocks, some more, some less depressed. Thus we have evidence that during the chief epochs of folding and overthrusting in the "Dolomites" the whole region stood much higher, and now represents a sunken and fragmented Alpine "central massive."

The transverse and oblique folding and overthrust movements have affected



FIG. 5.—PORTION OF THE EASTERN TRANSVERSE ARCH OF SELLA MOUNTAIN IN THE DOLOMITES, VIEWED FROM THE EAST ON CAMPOLUNGO PASS. SD = SCHLERN DOLOMITTE.

Eocene and even Oligocene strata within South Tyrol, and must therefore have been in progress during the Oligocene and Miocene geological epochs; while the faults that have displaced the folds and overthrusts may have originated at various periods, but certainly must have been also later than these epochs of overthrusting.

We seem, therefore, bound to refer these displacements and adjustments at the earliest to the Miocene era, when the loading and unloading of rocks that had been in process both by dynamic and subaerial agencies of denudation had considerably altered the earlier conformation of the uplifted system. From the evidence of the subsidences in the Dolomites, it is particularly to this adjustment phase that we may refer the *relative descent* of the limestone and dolomite ranges, and the *relative uplift* of the central massives and central chain of the Alps generally. The subsidence of the lateral chains enabled the outward creep of masses of rock to take place from the central chain over the limestone and dolomite chains, and further overthrusting movements from areas of uplift over troughs both within the Alps and on the outer zones, in which Oligocene and

Miocene deposits had already gathered. Thus it is necessary to decipher one set of movements superposed upon another again and again in the long history of the Alpine upheaval, and the actual relations that we now see are *resultant* relations.

This undoubtedly presents the most involved picture of the Alpine upheaval which has yet been given, but it may seem simpler if analyzed with the aid of the above illustration of the compression of a lath in different directions, and the effects of cross-warping that inevitably ensue. Let us suppose, instead of the lath, a series of sedimentary deposits of uniform character subjected to lateral pressure from a certain direction. Then, with the beginning of compression, the tendency is for the layers to be least disturbed in their relative position at the "crests" of arches and the "kernels" or hollows of troughs, and to assume a tilted position in the "middle limb," or intermediate part between an arch and a trough. The



FIG. 6.—PORTION OF THE WESTERN TRANSVERSE ARCH OF SELLA MOUNTAIN, IN THE DOLOMITES (TOWARDS VAL DELLA STRIES). DK = DACHSTEIN LIMESTONE OR DOLOMITE. R = RAIHL STRATA. VIEWED FROM THE EAST, NEAR THE BAMBERG SHELTER HUT BELOW BOE SUMMITS.

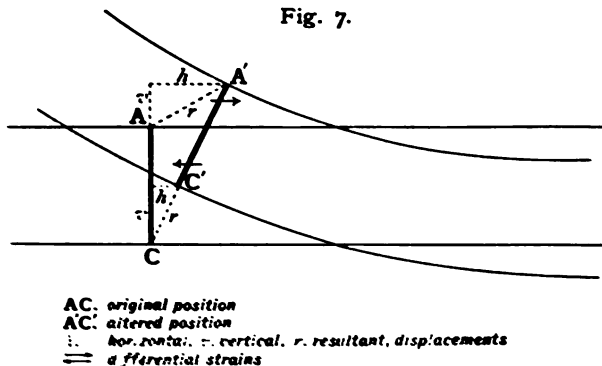
tilting of the series implies that, accompanying the vertical translation, there is a lateral displacement in rotatory sense of any vertical row of particles composing the several layers, the particles being displaced relatively to their own original position and relatively to one another.

In Fig. 7, let the points A and C in the vertical line AC represent the original position of the uppermost and lowermost particles, and let A' and C' be the altered positions of the points after some period of lateral compression. At first, before the series is much shortened in its horizontal extent, the point A turns to the right, C to the left of their original positions; but with increased compression and subsequent farther shortening of the series, both the points A and C may move to the right of their original position, A, however, relatively farther than C. Clearly under compression there is relative differential movement between A and C. The

horizontal components (h) and the vertical components (v) of the resultant displacement (r) are different for the particles in the upper and lower horizons, the lower horizons in Fig. 7 being retarded relatively to the upper horizons. If we turn the figure upside down, it represents then part of an arch in which the upper horizons have been retarded relatively to the lower.

As compression continues (cf. Fig. 2), the tendency will be for the upper horizons to keep slipping partially over one another and accumulating in the trough or inthrow area; and with increased intensity of lateral pressure, the chief

Fig. 7.



crush effects in the upper horizons would be within the trough, the chief crush effects in the lower horizons would be in the body of the arch, while in the intermediate area between arch and trough, the sliding, shearing, and overthrust effects would be chiefly presented. At the same time, the chief stretching and rending effects would be in the upper horizon of a series in the crest, and in the lower horizons of the same series in the trough. There faults might form, and in some cases igneous intrusions might become intermixed with deposits and crush-breccias. On account of the differential strains along each vertical line (Fig. 7), there is the tendency for inclined fault-planes to form through the midway points, therefore to fade inward to the trough, and to intersect more steeply inclined or vertical fault-planes passing through the intermediate area between arch and trough.

If the horizontal compression becomes very great, one or both arch-crests on opposite sides of a trough may bend back above the trough at the intermediate area. Then more complex results are obtained: inclined fault-planes with downthrow towards one trough may be parallel with reverse fault-planes upon which a portion of an arch has moved backward over an adjacent trough; oppositely directed reverse fault-planes may form, or an earlier series of arches and troughs may be cut by later reverse planes and the advance of overthrust rock-masses. It follows that these groups of intersecting planes of fault must be presented with which geologists are familiar in the sections of highly disturbed regions.

In accordance with the last illustration, let the sheet of deposits be subjected afterwards to lateral compression from any other direction, let the conditions of strain be varied to any appreciable degree, so that we have a resultant system of displacements combining different systems that have acted over the whole sheet of deposit. Under such conditions of regional cross-compression, the most striking effect observed—even upon observational grounds—would be that of neutralization, since all the possibilities that arise under intense lateral compression from one

direction are also true for the effects of lateral compression from the oblique and transverse directions.

So long as Alpine geology was based upon the principle of lateral pressure acting from one direction, no sufficient structural explanation of an Alpine central massive was forthcoming. Accepting the principles of cross-compression, the "fan-shaped structure" of the central massives, and generally the "whirl-shaped" figures in the conformation of the Alps and in the conformation of the mountain systems round crust depressions of Southern Europe, find as natural an explanation as the whirl-shaped forms in the region of the "Dolomites" which I examined.

The same modes of deformation that are accomplished on a grand scale by the action of varying cross-strains due to regional causes and acting over wide regions, are accomplished on a smaller scale by the local action of these subsidiary cross-strains arising from differences of resistance exerted in different directions with a sheet of heterogeneous rock-material. The combination of any subsidiary with any major movement produces a resultant local deformation, and the proportional intensity of different strains must be subject to all manner of local variations during the progress of regional movement. In short, consistently with what I have seen in the Dolomites, I am of opinion that all crust-deformation due to lateral compression is accompanied either locally or over wide regions by cross-movements, and presents corresponding resultant displacements of rock-masses, layers, and particles.

In a paper read at the Dover Meeting of the British Association (September, 1899), I compared the superposition of subsidiary crust-movements upon greater crust-movements, or generally of two or more different movements upon one another, with the familiar case of "Harmonics" in physics. As that paper has not been published, the following passage is quoted:—

"The fundamental structural form of the Gröden pass is that of an arch, while the fundamental form of the opposite mountain massives is that of a reciprocal trough on either side of the Gröden pass arch. The distortion of the fundamental forms has been caused by the tendency to the superposition upon the major forms of other subordinate or cross-forms due to subordinate or cross-strains; so that the present conformation of the surface on that area may be described as a *resultant* conformation. Similarly, what is designated a Central Massive in the Alpine mountain-system bears upon it numerous subordinate crust-forms due to subordinate movements, and a major trough or 'basin' in the Alpine system comprises numerous subordinate arches and troughs. The 'dolomite' district of South Tyrol, for example, is a crust-basin, which is incorporated in the Peri-Adriatic area of subsidence, but itself comprises numerous local areas of subsidence (such as Sella Massiva and Sett Sass), demarcated by local areas of uprise (such as Gröden pass and Campolungo pass).

"Again, the great Alpine massives and Alpine basins are themselves component parts of the *regional* uprise represented by the mountains of Southern Europe as a whole in their relation to adjacent areas of relative depression.

"This aspect of the structure of any great mountain crest or system presents a suggestive resemblance to a diagram of the condition of a medium transmitting a complex sound, such as that of a musical note with several harmonics (cf. Fig. 8 from Fourier). . . . Indeed, the complications of geological structure that may result from successive or simultaneous applications of simple lateral pressure are such as in the end to produce a map as little suggestive of simple anticlines and synclines as the diagram of the medium transmitting a musical chord is of several diagrams representing the effects of the constituent notes.

"We have, in studying the Alpine system of crust-forms, to keep well in view

the 'interference' of smaller movements with greater; the tendency to the superposition of movements affecting any two subjacent layers or horizons of the crust upon folds affecting greater thicknesses of the crust or complete crust-blocks; likewise the tendency to superinduce folds within a small area upon folds extending over a wider area; more generally, the tendency to superinduce cross-folds at various angles upon longitudinal folds, or any different series upon one another; and the consequent development in the crust of characteristic series of torsional phenomena varying in accordance with the complexities of the cross-movements.

"In case any one should question if cross-folds can tend to form simultaneously, I shall merely indicate the line a reply would take. We have to remember that at any one locality there may be a fundamental folding movement taking place in virtue of a great regional set of earth-pressures, and at the same time subsidiary folding, sliding, and shearing movements taking place in virtue of local pressures. It is true that any territory folded in such a way would indicate folding around

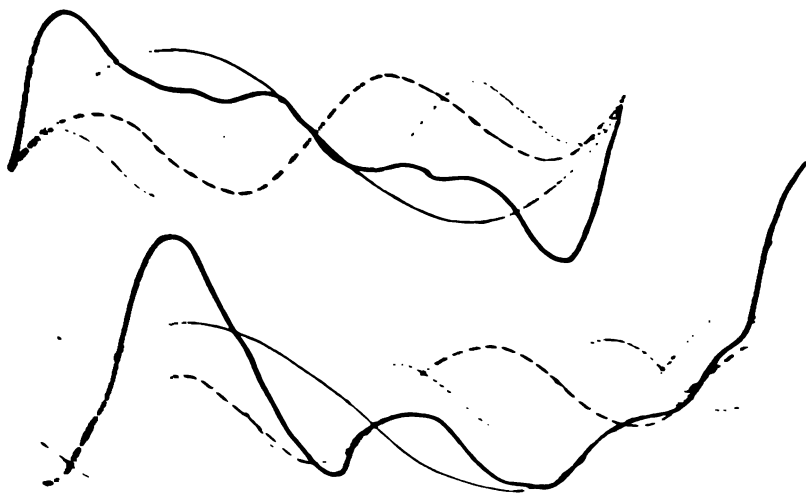


FIG. 5.—SIMULTANEOUS WAVE MOTION.

— wave 1. - - - - - wave 2. partial result of interference.

Actual results have shown, during the simultaneous propagation of the simple waves corresponding to a wave in water, and to result, two phases occur.

Before we can begin to bring to bear on the most famous theories of Alpine upthrusts. The better appreciation, however, of the "mechanism" of differential motion in any part of the Earth's crust undergoing deformation brings us in these days back to the general movement upon a more correct physical basis."

Those who are familiar with the mechanics of a wave, corresponding not to wave motion but to the motion of a solid body, will at once realize how many different forms of equal and opposite parts of movement might be described by earth-particles under the influence of external and internal forces. In fact, the motion of such particles might be caused to be either positive and negative, and the result, when a wave passes, be a neutral state, or either a positive state, or either a negative state.

There is, in the result of the wave's motion, a further peculiarity, that sometimes the particles are not only moved in one direction, but are also

tions with reference to local foci, and that these displacements have taken place in virtue of superposed movements, conjointly verify for dynamic movements in the Earth's crust the general conception of phenomena of "interference."

To sum up, each rock-particle in the Earth's crust, when under the strains of lateral compression, behaves (1) as an individual bearing dynamic relations to neighbour individuals; (2) as an integral part of a rock-layer, facies, or mass bearing dynamic relations to adjacent and subjacent rock-layers, facies, or masses respectively; (3) as an integral part of a locality or region of the Earth's lithosphere bearing definite dynamic relations to the localities or regions next it; (4) as an integral part of a superstructure whose floor is in many places molten, and therefore plastic.

A disturbance in any one of these dynamic correlations carries with it a disturbance in the others. The action of a simple lateral thrust over a wide region during regional crust-compression is scarcely conceivable under these complex conditions of correlation.

THE PETTERSSON-NANSEN INSULATING WATER-BOTTLE.*

By HUGH ROBERT MILL, D.Sc., LL.D.

PROF. PETTERSSON has, in conjunction with Prof. Nansen, completed a modification of his well-known apparatus for obtaining samples of sea-water without change of temperature. A specimen of the improved water-bottle constructed by Messrs. L. M. Ericsson & Co., of Stockholm and London, was exhibited in the museum arranged for the illustration of papers read to the British Association at the Bradford meeting. The purpose of this apparatus is to enclose a quantity of sea-water at any desired depth, to hold it securely, and to bring it to the surface without any change of temperature exceeding one-hundredth of a degree Centigrade. The previous form of insulating water-bottle was found by Dr. Nansen in his arctic expedition to be less trustworthy at great depths than in shallow water, hence the suggestions which resulted in the new apparatus.

The insulation, which is the essential feature of the water-bottle, is secured by a series of concentric chambers of non-conducting material, which are simultaneously filled with water, and so protect the portion, measuring about 2 litres, which occupies the large central tube. The cylindrical body is so constructed as not to become heated by compression at the greatest depth. This is effected by using metal, which is heated by compression, and indiarubber or ebonite, which is cooled by compression, in such proportions as to ensure constancy of temperature for the whole structure.

The water-bottle when set (see Fig. 1) is held apart so that the base, cylindrical body, and lid are separated, and the water passes freely through the concentric tubes, which occupy the cylindrical body, as the apparatus descends. When the apparatus is being drawn up, the propellor (which, during the descent, revolves freely) engages with a screw and releases the shackle supporting the lid. A heavy weight hung from the sides of the lid causes it to drop on to the top of the cylinder, which in turn is driven against the base, and the three parts of the water-bottle are locked rigidly together (see Fig. 2). On closing, the indiarubber discs which cover and project from the lower surface of the lid and the upper surface of the base-plate completely shut all the concentric tubes, and prevent any

* Read at the British Association meeting at Bradford, September, 1900.

movement in the enclosed water. An arrangement is provided for the relief of pressure as the included water expands on being hauled up, the indiarubber ball

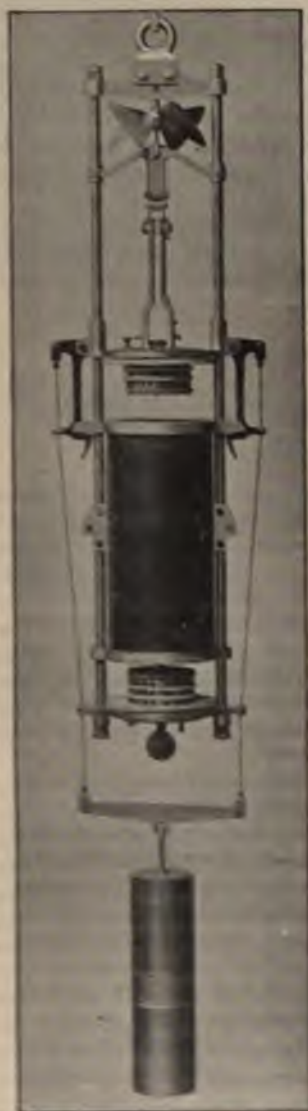


FIG. 1.—PETTERSSON-NANSEN WATER-BOTTLE DESCENDING, SET AND READY FOR USE.



FIG. 2.—DITTO ASCENDING, CLOSED AND LOCKED.

seen in the photograph below the base-plate being in communication with the central tube. The propeller can be adjusted so as to release the catch after one, two, or more revolutions. After it has done so, it revolves freely. The temperature

is ascertained by a thermometer, protected against pressure (the metal case of which is alone shown in the figure), enclosed in the central tube, and projecting sufficiently far to be easily read. If preferred, the aperture for the thermometer may be closed (as shown) by a screw, and the thermometer inserted when the water-bottle is brought up. After the temperature has been observed, the water may be drawn off from the central tube by an ingenious stopcock, the lever of which works horizontally, so as to run no risk of being opened by pressure in moving through the water.

A reversing thermometer to give the temperature of the water independently may be attached to the upper part of the water-bottle by detaching the ring shown at the top of the instrument and bolting on a metal frame with a ring above. The thermometer is set in action at the moment of closing.

The whole apparatus weighs about 50 lbs., and is used on a wire line and worked by a steam-winch. Its framework consists of two solid brass rods parallel to one another, supporting the propellor frame above, the base-plate below, and the locking-blocks in the middle. The cylindrical body and the lid slide on these rods. The lower part of the weight, which serves both as a sinker and the actuator of the locking-gear, is made hollow and detachable, closed below by an indiarubber valve opening inwards, so that if it strikes the bottom it will enclose and bring up a sample of the sediment. However, it appears to me to be inexpedient to risk so heavy and delicate an instrument in such close proximity to the bottom, since at great depths it would almost certainly fall on its side and get clogged with mud before the running out of the line could be checked. It will probably be found better in practice to attach the deposit collector to the deep-sea sounding-lead.

During August, 1900, the improved water-bottle has been tested by Prof. Nansen on board the *Michael Sars* in the sea between Iceland and Spitsbergen, and at the greatest depth met with (3000 metres; 1670 fathoms) the insulation was perfect. On August 11 a sample was taken from 3000 metres, and when it came up the thermometer read $-1^{\circ}285$ C.; after 5 minutes, $-1^{\circ}283$; after 9 minutes, $-1^{\circ}270$; and after 11 minutes, $-1^{\circ}210$. On August 13, from 2000 metres (1110 fathoms), the thermometer showed $-1^{\circ}135$; after 5 minutes, $-1^{\circ}135$; after 6 minutes, $-1^{\circ}130$; and after 8 minutes, $-1^{\circ}110$. It is considered essential to use an included thermometer to secure exact results when working in polar waters, for which, indeed, the water-bottle was specially designed.

Prof. Nansen has also experimented with an insulating water-bottle in which the insulating material consists, in addition to the concentric water-tubes, of a ring of eighty exhausted glass tubes, similar to the vessels used by Prof. Dewar in his experiments on liquid gases. Its insulation was proved to be perfect.

THE MONTHLY RECORD.

EUROPE.

Limnological Investigations on Lake Ladoga.—A note in the *Comptes Rendus* of the French Academy of Sciences (1900, No. 26) gives the results of investigations into the temperature of Lake Ladoga, carried out by Colonel J. de Shokalsky during the summers of 1897 and 1899. In both of these years the lake was visited during the first half of July, cruises being made in a small steamer, and the temperature of the lake-water taken at various depths, in 1897 at fourteen stations, and in 1899 at 20. A comparison of the results obtained on the two occasions is of considerable interest. In 1897 the distribution of temperature

through the different layers was *direct* throughout, though a great difference was observable between the figures obtained in the north and south of the lake, the water of the northern, deeper, part being colder, both at the surface and at fixed depths, than in the south. The warmest surface water (in the south) had a temperature of 55°·6 Fahr., and the coldest bottom water (in the north) one of 39° Fahr. These temperatures seemed relatively low for the time of year, but lower still were recorded in 1899, especially in the north. In the latter year the vertical distribution of temperature was found to be *inverse* at all the deep-water stations, the difference from the state of affairs in 1897 being attributable to the unusually low temperature which had prevailed throughout North-Western Russia during the spring and early summer. Although Ladoga certainly belongs to the category of temperate lakes according to M. Forel's classification, it would appear to come very near the border-line which separates such from polar lakes, in which the vertical distribution is always inverse. The maximum temperature-gradient occurred at a much lower level in 1899 than 1897, a fact, of course, due to the generally higher temperature of the water in the earlier year.

ASIA.

Dr. Sven Hedin's Latest Journeys.—Writing from Abdal, in the Lob Nor district, on June 27 last, Dr. Sven Hedin gives further details as to the programme of his journeys in Northern Tibet and neighbouring regions during the summer and autumn of the present year. At the time of writing, he was about to start for the Chamen Tagh, whither his caravan had already preceded him, his intention being to cross the Astyn Tagh and Koko-Shili ranges, so as to obtain a geological section of the country, and correct his route with that of his former Tibetan journey. After returning to his head-quarters in the Chamen Tagh, he hoped to make his way across Northern Tsaidam to Sachu, and thence west to the old bed of Lob Nor, continuing his investigations of the latter and of the ruins in its vicinity. Thence he proposed to carry a chain of altimetric observations to Kara-koshun and Chaklik, at which latter he hoped to arrive about January 1, 1901. It is announced that a report on Dr. Hedin's descent of the Yarkand river, and crossing of the Takla Makan, between Lob Nor and Cherchen, has been received from the traveller by the King of Sweden.

Marco Polo's Itinerary through Persia.—Captain P. M. Sykes writes from Persia, calling attention to an obscurity which attaches to the question of Marco Polo's outward journey through Asiatic Turkey and Persia, and on which Sir H. Yule seems to have been unable to throw light. That writer, in fact, appears to present two different views, without attempting to decide between them. On the map giving Marco's own geography (Yule's 'Polo,' 2nd edit., Introd., p. 107), the outward route is shown as passing through Armenia to Tabriz, and thence south-west to Kerman, whence it is drawn as turning north towards Khorasan. In the introduction, however (p. 19), it is supposed that, after passing through Ayaz and Sivaz, the route led by Mardin, Mosul, and Baghdad, to Hormuz; and it is shown in a similar way in the first section map of Marco's itinerary (vol. i. p. 1). Again, on p. 66, note 2, doubt is thrown on the idea of Marco travelling by Kisi (Kish, or Kishm), the mention of which follows the description of Baghdad. Captain Sykes's view is that Baghdad even was not visited by the traveller, but that from Ayaz he went to Tabriz, and thence by Sultanieh, Sava, Kum, Yezd, and Kerman, to Hormuz. Thence, finding boats unseaworthy, or for other reasons, he returned by Sirjan to Kerman, and thence to Khorasan. Yule's map, above referred to (Introd., p. 107), shows the outward route from Tabriz to Kerman as an imaginary straight line, missing Yezd, which was passed through on the return journey. Captain

Sykes, however, considers that from the indications of the text, both the outward and return journeys followed the same route between Tabriz and Kerman.

Proposed Map of India on the Scale of 1:1,000,000.—The Survey of India Department has determined to supply a long-felt want by the preparation of a general map of India and neighbouring countries on the scale of 1:1,000,000, being the scale adopted for the map of the world advocated by the International Geographical Congress. In a recently issued pamphlet (Professional Paper, No. 1), Colonel Gore, the present Surveyor-General, discusses the question of the projection to be adopted, the size and shape of the sheets, and other similar points. In spite of the advantages arising from the projection of each sheet on its own central meridian, this is open to the fatal objection that it is impossible to join the sheets together to make one large map. It has therefore been decided that there must be one projection for the whole map, some form of conical projection being used; and to avoid as far as possible distortion of scale, a secant conical projection has been chosen, the intersections being made in the parallels of 16° and 32°. The longitudes will be referable to the Greenwich meridian, taking that of Madras Observatory as 80° 14' 47", the most recently determined value. The bounding lines of each sheet are parallels and meridians, the side margins being thus straight but slightly converging lines, while the top and bottom margins are concentric circles. The map will embrace the whole area from the west of Persia to the east of Burma (44° to 104° E. long.), and from Ceylon to the Oxus (4° to 40° N. lat.); the whole of Tibet, with parts of Turkistan and Western China, being thus included. The total number of sheets (excluding those occupied wholly by sea) will be 106, each embracing 4° of latitude and 4° of longitude. Those relating to India proper will be engraved, the rest photozincographed, at least in the first instance. A table of co-ordinates for plotting the graticules of the sheets is given with the paper.

Results of the Pavie Mission in Indo-China.*—A series of publications, which promises to be of great value for the geography of French Indo-China, is in course of preparation in Paris. It deals with the results of the well-known mission, which, under the chief direction of M. Auguste Pavie, executed the first accurate surveys of large portions of Laos and Annam between 1879 and 1895. The two volumes first published, from the pen of M. Pavie himself, belong to the section "Études diverses," and treat of the literature and history of Cambodia, Laos, and Siam. Of the geographical section, which will comprise in all some five or six volumes, the third volume alone appears to have been yet issued, though M. Pavie's introduction on the general geographical results of the mission was already, early this year, in an advanced stage. The volume now under review is by Captain Cupet, on whom, among the forty Europeans from first to last attached to M. Pavie's staff, the largest share of the topographical and geographical labours devolved. Captain Cupet describes in turn the various expeditions carried out by him in the course of his surveys, adding some useful general observations on the geography and ethnology of Laos and neighbouring countries. The results of the surveys are shown on fifteen sheets, on the uniform scale of 1:500,000, which supply a valuable groundwork for the mapping of a large part of French Indo-China. Captain Cupet's earliest and most extensive work lay in the upper Laos country, on the left bank of the Mekong, from the Black river to the latitude of Vinh. In his general sketch of this region, the author dwells on the influence of the river systems on the political history of the country, each great basin forming a political unit, while the streams, although tortuous, constitute almost the only means of

* Mission Pavie, Indo-Chine, 1879-1895. *Géographie et Voyages,' iii.: "Voyages au Laos," etc. Par le Capitaine Cupet. Paris: Leroux. 1900.

communication amidst the mass of mountains with which the country is filled. The orographic centre of the region is the *massif* of Pu-loi, with an altitude of some 6500 feet, which gives rise to the Song-ka, the Nam Suong, and the Nam Het. Captain Cupet's later explorations were concerned with the country inhabited by various wild tribes on the frontiers of Annam and Cambodia, and his volume contains much information respecting these. He divides the aborigines of Indo-China into three broad groups, the first constituting a central core between the territories of the Annamites, Cambodians, and Thais; the second, somewhat more civilized, occupying an outer zone, especially towards the north and west; and the third scattered over the mountains in the midst of the more advanced populations. The political importance of these races, which form a barrier between Annam and the Mekong valley, must, he says, be evident to all, and, unless definitely occupied, their country is likely to be the focus of future disturbances.

The Bay of Balik Papan, East Borneo.—Mr. Henry Richards, a surveyor in the employment of the mercantile firm of M. S. Samuel & Co., sends us an account of the Bay of Balik Papan, a small but excellent harbour on the coast of Dutch East Borneo. As is well known, the east coast of Borneo is, as a rule, low and swampy, with few natural havens, the only trading posts of any importance in the Kutei Residency being situated inland on the Kutei or Mahakkam river. The bay of Balik Papan occurs in $1^{\circ} 15' 55''$ S., almost immediately below the delta of that river, at a point where the coast-line is higher and more abrupt than elsewhere. It is well sheltered from the swell of the Straits of Macassar, and has deep water, affording safe anchorage to vessels during both monsoons. In 1897, Messrs. Samuel & Co. obtained a concession from the Dutch Government for the working of coal and petroleum, and since they commenced operations the channels have been carefully surveyed and buoyed by the authorities, so that vessels drawing 24 feet can approach the wharf at all states of the tide. The place seems, until recently, to have entirely escaped notice, the population, now 2000, having been nil before 1897. Off the point of Pulo Tokong there is a small island formed of sandstone boulders, surrounded by very deep water. It is frequented by Argus and fire-backed pheasants. The name Balik Papan is said to signify "the return of planks," from a legend telling of the miraculous return to a Malay settler of the planks which formed his yearly tribute to the Sultan at Kutei. His grave, supposed to be on the island above mentioned, is now held sacred by the natives.

AFRICA.

Surveys in British South Africa.—The recently issued report of the astronomer at the Cape contains a statement of the progress made with the geodetic survey of South Africa down to the end of last year. In connection with the decision to carry the railway due north from Gwelo, it was resolved to continue the work on new lines, the triangulation being pushed rapidly forward in the same direction. By this means valuable aid towards the accuracy of the railway and other surveys was afforded, while the measurement of the proposed geodetic arc along the 30th meridian was also furthered. Before the end of July twenty-four stations had been occupied, and the angles of the triangles in the arc measured as far north as $18^{\circ} 35'$ S. The reconnaissance and beaconing of fourteen additional stations carried the arc to Nyamanje ($16^{\circ} 30'$ S., $30^{\circ} 45'$ E.), within 60 miles of the Zambezi, but the work was then stopped by the smoke from grass-fires. The operations for the demarcation of the Anglo-German boundary have been rendered very tedious and indirect, it being found impossible to carry triangles from Rietfontein northwards, owing to the flat and waterless character of the country traversed by the 20th meridian. It was hoped that the field work of the triangulation would

be finished by August of the present year, the actual demarcation being reserved for the following December, the month in which the water-melons are in fruit.

Mr. Weatherley on Lake Mweru.—Mr. Poulett Weatherley writes from Chita, on Lake Mweru ($8^{\circ} 45' 47''$ S.), giving some details of various observations made by him on the lake-shores. He has not yet completed a map of the lake, but hopes to do so eventually, the conspicuous landmarks which exist on either coast affording great facilities for a compass survey, such as are entirely absent on the swampy margins of Bangweulu. From bearings already taken, Mr. Weatherley is inclined to think that in maps which have been published due allowance has not been made for compass variation, which is said to be 12° W. at the present time. If this is so, the result would of course be that the axis of the lake would be still further removed from the direction of the meridian than is generally shown, and this is borne out by Mr. Weatherley's statement, that from Chipamba, on the east coast, the true north is about in the direction of Mpweto's, while from Mount Pirie, on the west coast ($8^{\circ} 50' 40''$ S.), true south is about in the direction of the Chimbofuma inlet. Other bearings determined by Mr. Weatherley are as follows:—

Point of observation.	Latitude.	Object observed.	Magnetic bearing.	True bearing.
	$^{\circ}$ $'$ $''$		$^{\circ}$	$^{\circ}$
Chienje ...	8 28 30 S.	Kasengeneke bluff *	319	307
Kasengeneke	8 28 32 S.	Kalungwizi delta	179	167
Chita ...	8 45 47 S.	" "	153	141

The opposite shores are distinctly visible, the one from the other, so that innumerable cross-bearings may be taken. On the west side the principal landmarks are: (1) Mount Kampingi, on the north side of the Lualaba exit, in the centre of the curve made by that river. (2) Mounts Bolibwe and Pirie, table mountains only about three-quarters of a mile apart, and standing somewhat out from the escarpment of the Bukongolo plateau, in about $8^{\circ} 50' 40''$ S.; from Pirie the whole lake, with the exception of the extreme north-west corner, is visible. Its height above sea-level is 4158 feet, and above the lake 958 feet. (3) Mount Ngongwe, or Gngongwe, an isolated peak some 6 miles from the shore, in $2^{\circ} 5' 3''$ S. On the shores of Bangweulu few points reach more than 40 feet above the surrounding marsh and water. The most pronounced are Silosi and Changilo, which may possibly be 80 to 100 feet high. Mr. Weatherley seems still not quite satisfied with his work on Bangweulu and the Luapula, but is doubtful of being able to return to put the finishing touches to it. He has sent us some excellent photographs of Bangweulu, Mweru, and the Luapula.

The British Central Africa Protectorate.—Mr. Alfred Sharpe's report on the British Central Africa Protectorate for 1899 records a satisfactory increase in trade and revenue, the value of exports having doubled, while that of imports has increased by 50 per cent. The year was very favourable for the coffee crop, and the export of the produce rose, as compared with the preceding year, from 23,000 odd lbs. to 62,000. Tobacco and chillies have also been grown with success, while the cultivation of rice on the shores of Lake Nyasa promises good results. Various new roads have been opened, but the great need of the country is a railway from Chiromo to Blantyre, to be eventually extended to Nyasa. Transport requirements have so largely increased, that almost the whole labour-supply is

* On south side of Lualaba exit.

occupied in carrying loads, leaving little available for planting and other operations. Mr. Sharpe thinks that in the current year the whole labour-supply will hardly cope with the transport question, and that, unless a railway is built, the Protectorate has almost reached its limit of production and export. Navigation on the Shire has been comparatively easy, the level of Nyasa having been higher than at any time since 1896. The Admiralty are bringing out a chart of the lake, based on the work of Lieut. Rhoades, who is at present engaged in obtaining systematic sets of soundings. In connection with the definition of the Anglo-Portuguese boundary, both in the east and west of the Protectorate, the survey office assisted in the mapping of 8000 square miles of country, the lower portion of the western side alone remaining to be defined. The European population has slightly increased, while Indian traders, whose operations are probably of service to wholesale dealers, have settled during the year at various stations. The report includes observations by Dr. Gray on the health of the Protectorate. Malarial fever, though causing much inconvenience, is not a deadly disease in Nyasaland. Haemoglobinuric fever continues to resist efforts to cope with it, though the mortality rate has somewhat lessened under improved treatment. Dr. Gray points to the fact that the best health is enjoyed by the administration officials, as indicating that indoor employment, coupled with moderate exercise in the evenings, is the most suitable for a European in British Central Africa.

French Explorations in the Sobat Basin.—A detailed account of the geographical work carried out in the Sobat basin by the several members of the Bonchamps mission has at last been published in *La Géographie* (July, 1900). In addition to the journey of M. Bonchamps himself in 1897, others of some importance were made in the following year by MM. Faivre and Potter, who made their way to the White Nile by way of the Ajubba, or Pibor, reaching *en route* a point as far south as 6°. The collected itineraries of the mission are shown by M. Michel, one of its members, on a general map on the scale of 1 : 3,000,000, while, as already mentioned in the *Journal*, a special map in 14 sheets on the large scale of 1 : 200,000 has also been prepared by him. M. Michel gives a geographical sketch of the country traversed, paying special attention to the various upper branches of the Sobat. He divides the Abyssinian plateau, between the Hawash valley on the east and the plain of the White Nile on the west, into three zones. The first consists of wide treeless plains varying between 6500 and 8500 feet, covered in places with limestone strata, in which the few streams have cut themselves deep beds. The second zone is formed by a mountainous region about the sources of the Hawash and Omo, extending west to the valley of the Didessa. The chains rise to a height of nearly 10,000 feet, and are separated by deep valleys. Their upper parts are clothed with low forest, and the lower slopes with scrub, partially cleared for cultivation. The third zone, traversed for the first time by the French mission, resembles a sea of low hills of an even height (5000 to 5500 feet above the sea), which leaves not a mile of level ground between them. It is marvellously well watered by streams flowing to the Sobat, and produces coffee and honey in abundance. The most important river is the Baro, which has numerous tributaries, and is likely to prove of more economic value than the southern branch of the Sobat, which has a smaller volume. M. Michel gives detailed statistics of the Baro, Birbir, Didessa, and Ajubba (Pibor), stating their depth, current, etc., at different seasons. It is somewhat difficult to fit together the results of the French explorations with those of Captain Wellby. M. Michel makes the Ajubba and Ajuaru, which seem to represent the two Ruzis of Captain Wellby, take their rise in about 6° N. from the margin of a high plateau to the south; whereas, according to the English traveller, their valley continues at a

comparatively low altitude some two degrees further in that direction, only reaching a height of 2000 feet in about 4° N.

Economic Geography of the French Sudan.—The July number of *La Géographie* contains a paper by M. Baillaud on the economic value of the French Niger territory, accompanied by a map, in which the principal facts connected with the commercial geography of that region are shown in a striking and somewhat novel way. The commercial importance of the various centres is shown by circles, of which the size is proportional to the total trade carried on by each. The principal trade routes are also shown by bands of colour, of which the breadth is proportional to the volume of trade passing along them, while the colour denotes the race by which it is carried on. The map brings out in a striking way the barrier to commerce which has been formed by the forest zone along the shores of the Gulf of Guinea, almost all the more important centres (with the exception, before its destruction by Samory in 1897, of Kong) lying in the upper Niger and Senegal basins, and carrying on their commercial intercourse with the north and west. Compared with the routes from St. Louis to Kayes and Medina, and from the north across the Sahara to Timbuktu and Niore, all other channels of communication with the outside world show, according to M. Baillaud's map, an exceedingly slight commercial movement. The external trade with the north is of course carried on by Moorish caravans, while the internal routes are frequented principally by small traders (Diulas) of the Mandingo race in the west, and of that of Mossi in the east. M. Baillaud divides the country into zones, according to the chief characters of its agriculture and vegetation, showing also the limits of the growth of the principal economic products—rubber, kola-nuts, karite, etc. In regard to the present lines of commerce, he shows how the importance of Timbuktu as the distributing centre for the Sudan has diminished since the opening of the route from Medina *via* Niore, and the consequent falling off of the Saharan trade. It is, however, still the greatest market for salt in the whole of Africa, and this will probably secure a continuance of its prosperity. M. Baillaud, whose voyage down the Middle Niger has already been referred to in the *Journal*, entertains sanguine views as to the use of the river as a means of communication, and considers it possible that French goods may find a market in the Hausa states of the Central Sudan by this route. The Hausa merchants already have dealings with the eastern borders of the French Sudan, especially at Sansan Hausa, which has lately taken the place of Say as a trade centre.

AMERICA.

Proposed Improvement of the South-west Pass of the Mississippi.—The need for additional facilities for entering the mouth of the Mississippi by large vessels has lately led to the discussion of projects for the opening of the south-west pass by means of breakwaters. Two reports have already been made to Congress by boards of engineers, the measures suggested being in the one case the construction of two parallel jetties, in the other that of bottle-shaped jetties, on either side of the stream. No definite conclusion has, however, been yet arrived at, and meanwhile a fresh scheme has been put forward by Mr. Lewis M. Haupt, who, in the July number of the *Journal of the Franklin Institute*, describes a method by which he thinks the natural energy of the stream may be utilized for the opening of a channel by the construction of a single curved jetty, so placed as to produce a reaction and scour across the entire bar, and effect a lateral displacement of silt to the opposite bank of the channel. The writer lays stress on the concentration of energy obtained by the concave curvature of a river-bank, which, as is well known, always results in a deepening of the channel in its vicinity. Of the 175,000 square feet, representing the present area of discharge along the bar

crest, he proposes to cut off 115,000 square feet, or .66 per cent. The threefold discharge thus produced over the remaining third of the river section would, in the first instance, cause an increase of velocity, and, in the second, the gradual enlargement of the section as its consequence, these results following the progress of the work, so that the improvement would be rapid in proportion to the rapidity of construction of the jetty. This would start from East Point and have a length of about 4 miles, during the second half of which it would curve gently to the west. Mr. Haupt holds that a normal section would thus be produced with resulting mean depths of over 40 feet, such as are found at present in the inner portion of the pass. The advance of the bar seawards, which during the interval between 1838 and 1898 was at an average rate of 259 feet per annum, and which would be increased by the adoption of parallel jetties, would, he thinks, be immaterial on the plan described.

Dr. Sapper's Volcanic Studies in Central America.—In the seventh number of *Petermanns Mittheilungen*, Dr. Sapper gives an account of his examination, in 1897, of various volcanoes of Guatemala and Salvador, by which he has been able to make some additions and corrections to the work of von Seebach, Dollfus, and Montserrat, some thirty years previously. The most important of the volcanoes examined were those of Pacaya, Suchitan, and San Miguel, the first of which (8415 feet) presents one of the most complicated structures of all the Central American volcanoes. Dr. Sapper was unable to clearly make out its history, but is inclined to think that the great elliptical crater of Calderas, now in part occupied by the small lake of that name, was the primitive crater of the volcano, and that the eruptive forces subsequently shifted their activity to the south, in which direction the cone now active is placed. Suchitan has a large rock-crater, breached to the north-north-east, the interior of which is almost entirely covered with forest. Subsidiary cones and a second large crater occur round the flanks of the central crater. The volcano of San Miguel, which possesses both an inner and an outer ring-shaped crater, both of nearly circular outline, is of interest from the changes which have evidently taken place since the survey made by Dollfus and Montserrat in 1866. Dr. Sapper calls attention to the regularity with which the principal volcanoes are arranged in lines, which points to their formation along rifts in the Earth's crust. In South-Eastern Guatemala, on the other hand, a number of important volcanoes occur with no such regular arrangement, so that we must conclude either that these occupy positions on short, independent rifts, or that they are located singly on points of least resistance of the crust to the internal forces. The lesser volcanoes are for the most part subsidiary to those of the first rank, but some are so far removed from these as to be justly regarded as independent manifestations of volcanic activity. Their position cannot be assigned to definite rift-lines, but in certain regions a large number seem to be collected into belts. Dr. Sapper has, by his investigations, doubled the number of known volcanoes in the districts visited, but much remains to be done before our knowledge can be in any way complete.

A Century of Exploration in South America.—Prof. Sievers has done good service in summarizing, in the sixth number of *Petermanns Mittheilungen* for the present year, the history of South American exploration during the nineteenth century. The course of discovery in that continent has followed very different lines from that in other quarters of the globe, and its details are, perhaps, on the whole less generally known for that very reason. Although the broad outlines of South American geography had been made known before the middle of the sixteenth century, detailed exploration, which met with little encouragement from the Spanish and Portuguese authorities, has since proceeded with great slowness, and,

from many points of view, less is still known of large portions of the surface than the greater part of Central Africa. Prof. Sievers begins by sketching the state of knowledge in 1799, the year when Humboldt first landed on the shores of the continent; next dealing with the work of that traveller, which may be considered to usher in a new era in the history of the subject. With regard to the subsequent course of discovery, he points out the difficulty of laying down sharply defined periods, characterized by activity in one field or another. The work of exploration has been mainly carried on by private enterprise, and its scene has shifted from one quarter to another with great irregularity. A certain distinction may, however, be drawn between the Andes lands on the one hand and Brazil on the other, while during the latter half of the century the southern portion of the continent has formed a third theatre of exploring activity. The first half of the century the writer regards as the period of great journeys, or those extending over large portions of the continent, while since 1850 the work has been more detailed and systematic, especially in the south. A series of ten maps shows the state of knowledge at as many separate periods, the known portions being divided into three categories according to the degree of knowledge possessed about them. The last of the maps brings out in a surprising way the large areas about which no accurate knowledge exists, and the extent to which surveys have been confined, apart from particular countries, such as Argentina, to the courses of streams. At a distance from these the whole central core of the continent, occupying the greater part of the Amazon basin, appears as absolutely unknown.

Journey from Chesterfield Inlet to Great Slave Lake.—In Mr. Hanbury's paper, vol. xvi. p. 77, the first three minimum temperatures should be -11° , -13° , -1° .

AUSTRALASIA AND PACIFIC ISLANDS.

Quiros and the Discovery of Australia.—A question bearing on the discovery of Australia has lately aroused some interest in that country, and was the subject of discussion at a recent meeting of the Royal Geographical Society of Australasia (Victorian branch). In his 'History of the Catholic Church in Australia,' Cardinal Moran, known as a scholarly writer, started the theory that the land reached in 1606 by the navigator Quiros, instead of being, as has always hitherto been supposed, the island of Santo, in the New Hebrides, was in reality Queensland, and that the harbour of St. Philip and St. James is to be found in Port Curtis, on which the township of Gladstone now stands. Cardinal Moran's view naturally found many critics, to whom he has replied in various letters to the Australian press. At the meeting alluded to, the orthodox view was vigorously championed by Messrs. Theodore Bevan and Macdonald, though the new theory met with support from the chairman, Mr. Pantou. Cardinal Moran's arguments are far from convincing. They rest upon certain relics and traditions current at Port Curtis (e.g. the discovery there of an old brass cannon bearing the inscription "Santa Barbara, 1596"), and on various points in the narrative of Quiros, which the cardinal holds to apply better to Australia than to the New Hebrides. The theory, therefore, has the disadvantage of resting on the descriptions of a somewhat visionary enthusiast, endeavouring to arouse an interest at home in his discoveries. The points chiefly relied upon in its support are the abundance of animals spoken of, the cordilleras of very lofty mountains in the interior of the country, the size of the rivers mentioned, the supposed existence of marble quarries, and the "warbling at dawn" of the birds. The opponents of the cardinal called attention to a number of facts which cannot be harmonized with the supposition that Port Curtis was reached by Quiros, especially the entire disagreement of the latitude mentioned

both by Quiros and Torres with that of Port Curtis, the position of the land discovered relatively to other known islands of the Pacific, the use by the inhabitants of bows and arrows, and the general luxuriance of the country as described by Quiros. To these might be added the impossibility of reconciling the subsequent course of Torres (south-west and north-north-west) on the way to New Guinea with the position of Port Curtis, and the statement of Don Diego de Prado (an enemy, it is true, of Quiros) that the lands discovered by that navigator were merely "rocks and small islands."* Cardinal Moran and his supporters lay stress on the mention of pigs on "Austrialia del Espiritu Santo," saying that there is no evidence that those animals existed on Santo before the arrival of Europeans. To this it may be replied that pigs were found by Tasman in the still more easterly Tonga group, on its discovery by him in 1643.

POLAR REGIONS.

The Duke of the Abruzzi's Expedition.—The *Stella Polare*, with the members of the Duke of the Abruzzi's Arctic Expedition on board, arrived at Tromsø on September 5, after an absence in the far north of nearly fifteen months. The duke's party has achieved the distinction of beating all former records in respect of the highest latitude reached, which exceeded that of Nansen's furthest by 19' ($86^{\circ} 33'$, as compared with $86^{\circ} 14'$). From the accounts which have so far been made public, it appears that after reaching Cape Flora towards the end of June, 1899, the *Stella Polare* was able to force a passage up the British channel, one of the main openings amidst the Franz Josef Land archipelago, passing near Nansen's winter hut ($81^{\circ} 14' N.$), and reaching Teplitz bay on Crown Prince Rudolf Land, almost the furthest point attained by the sledge-party of the Austro-Hungarian Expedition in 1874, on August 9. Here, in $81^{\circ} 53' N.$, it was determined to winter, and steps were at once taken for the erection of an observatory and other quarters. On September 8, during unusually heavy ice-pressure, the ship was driven on shore, considerably damaged and leaking badly. A large tent was therefore erected, and in this the members of the expedition spent most of the winter, trial sledge expeditions being, however, undertaken from time to time. During one of these the duke had his fingers badly frost-bitten, and was unable to take an active part in the further work of the expedition. The leadership of the sledge-party for the north therefore devolved on Captain Cagni. About the new year the cold became more intense, but the weather being as a rule calm, it was not so severely felt as it would otherwise have been. On March 11 Captain Cagni set out his northward journey with twelve companions, a course being first steered for the supposed Petermann Land, which, however, proved to have no existence. Owing to the impossibility of forming depôts of provisions for the return journey, the whole supply had to be taken with the party; but in order to economize it as much as possible, three detachments of three men each were sent back at intervals of ten days, leaving Captain Cagni to continue the route with three men. The second return party, consisting of Lieut. Quirini, the Norwegian machinist Henrik Stokken, and one other, never reached their destination, and all search for traces of the party proved fruitless. During the northward march, the route of which lay considerably to the west of that of Nansen and Johannsen, the ice was at first extremely difficult, but afterwards became better, and had not provisions failed it would have been quite possible to have pushed still further north. As it was, Captain Cagni and his companions lived for the last fifteen days on dog-flesh, reaching Teplitz bay with only two sledges and six dogs. The journey had taken

* 'De Morga's Philippines' (Hakluyt Society's edition), p. 412.

one hundred and four days, the return being lengthened by the drift of the ice, which took the explorers to Erasmus Ommanney island, some distance south of Teplitz bay. The icy wilderness which had been traversed had been found entirely devoid of life. The *Stella Polare* was got clear of the ice on August 8, but after a quick passage down the British channel was again caught and imprisoned for a fortnight. The principal results of the expedition are the proof that no land exists to the north and north-west of Franz Josef Land, and the survey of the northern portion of the latter. On reaching Christiania on September 11, a hearty reception was given to the explorers, who were met by representatives of King Oscar and of the Norwegian Geographical Society, and among others by Sir Clements Markham, who was then staying in Norway. In the evening a torchlight meeting was held, at which Dr. Nansen made a complimentary speech. On September 14 the Duke reached Turin, where he received an enthusiastic welcome.

Another Andrée Buoy discovered.—The discovery of another buoy belonging to Andrée's expedition was announced from Skjervø, Norway (lat. 70° N.), on August 31. According to the communication enclosed within it, the buoy (No. 4 of the series) was thrown out at 10 p.m. on July 11. The balloon was, at the time of writing, at an altitude of 250 metres (820 feet), and the direction N. 10° E. A postscript states that this had changed to N. 45° E., and that the balloon was over very rugged ice, the weather continuing splendid. Four carrier pigeons had been despatched, and were flying west. This does not add much to our knowledge of the course of the voyage, as the date of the communication is still that of the day on which the ascent was made. The buoy No. 3, which had been found in July off the west coast of Iceland, proved, on examination, to be empty.

Lieut. Amdrup's Expedition to East Greenland.—Telegraphic intelligence has been received in Copenhagen to the effect that the *Antarctic*, with a portion of Lieut. Amdrup's party on board, reached Iceland on September 5, the expedition having met with considerable success. A landing was effected by Lieut. Amdrup at Cape Dalton, in 69° 25' N., on July 19, the explorer's intention being to complete the map of the coast from that point to 67° 20', where his work ceased last year, by a boat journey towards Angmagssalik. The rest of the expedition, under Dr. Hartz, explored and mapped the country northwards as far as Scoresby sound. The ice-conditions towards the south were favourable, and the party on board the *Antarctic* was able also to map the unknown region south of King Oscar fjord.

OBITUARY.

Dr. John Anderson, F.R.S.

DR. JOHN ANDERSON, whose death, at the age of sixty-six, occurred at Buxton about the middle of August, was best known to geographers for the part he took in the early exploring expeditions on the Burmo-Chinese frontier, while Burma was still an independent state. Dr. Anderson was born at Edinburgh in 1833, being the son of the late Mr. Thomas Anderson, secretary to the National Bank of Scotland; and was educated in that city, finally taking the degree of M.D. at Edinburgh University in 1861. After holding, for a year or two, the post of Professor of Natural History in the Edinburgh Free Church College, he received in 1865 from the Government of India the appointment of curator (subsequently changed to that of superintendent) of the newly founded Indian Museum at Calcutta, whither he had proceeded in 1864. A few years later he became, in addition,

Professor of Comparative Anatomy in the Medical College, Calcutta, and in 1868 he was chosen to accompany the expedition then proceeding under Major (afterwards Sir Edward) Sladen through Burma to China. At that time our knowledge of the upper course of the Irawadi was still most imperfect, and the work of the expedition, which for the first time ascended the river in a steamer to Bhamo, may be said to have begun on leaving the capital. The subsequent land-route led from Bhamo up the valley of the Tapeng, through a country inhabited by wild frontier tribes, to Momien, in Western Yunnan. A large amount of valuable information was collected, and afterwards embodied in Dr. Anderson's official report, which, in addition to the narrative of the journey, dealt in an exhaustive way with the history, ethnology, geography, trade-routes, etc., of the districts traversed. A second, and equally voluminous work, dealt with the natural history, the author's own special department. In 1874 Dr. Anderson again reached the frontiers of China with the expedition of Colonel Horace Browne, which met Mr. Margary on the completion of his arduous journey through China to Burma. As is well known, the expedition, after the murder of Mr. Margary, was forced to retire without fully attaining its objects. A narrative of the two expeditions was published by Dr. Anderson under the title 'Mandalay to Momien.'

In 1881 Dr. Anderson carried out, on behalf of the trustees of the India Museum, an investigation of the marine zoology of the Mergui archipelago, the results being afterwards published by the Linnæan Society. After his retirement in 1887, he devoted himself to zoological researches, especially on the fauna of Egypt, and it was to his zealous advocacy that the recent action of the Egyptian Government in instituting a fresh survey of the Nile was due. In connection with his visit to Mergui, he had paid much attention to the history of English trading relations with Siam, on which he brought out an interesting volume in 1890. He had been a fellow of our Society since 1885, but in 1870 had contributed a paper to our *Journal* (vol. xl.) on the sources of the Irawadi.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., LL.D., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Académie, Akademie.	Mag. = Magazine.
Abh. = Abhandlungen.	Mem. = Mémoires, Memoires.
Ann. = Annales, Annalen, Annalen.	Met. = Meteorological.
B. = Bulletin, Bulletin, Bulletin.	P. = Proceedings.
Com. = Comptes.	R. = Royal.
C. Ed. = Comptes Rendus.	Rev. = Review, Revue.
Erft. = Erdkunde.	S. = Society, Société, Seelskab.
Ge. = Geography, Geographie, Geografia.	Stett. = Stettin, Stettin.
Gea. = Geographie.	T. = Transactions.
I. = Institut, Institution.	V. = Verein.
Is. = Inseln.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
K. u. L. = Karte und Längschart.	Z. = Zeitschrift.
M. = Mittheilungen.	Zap. = Zapiski.

On account of the antiquity of the words *Academy*, *quædam*, etc., the size of books in the list here is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 x 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

- Alpine Tunnels.** *Nature* 63 (1900): 281-284. **Fox.**
 The Great Alpine Tunnels. By Francis Fox. *With Plans and Sections.*
- Alps.** **Yeld.**
 Scrambles in the Eastern Graians, 1878-1897. By George Yeld. London: T. Fisher Unwin, 1900. Size $8\frac{1}{2} \times 6$, pp. xx. and 280. *Map and Illustrations.* Price 7s. 6d. *Presented by the Publisher.*
 A collection of summer excursions amongst the Graian Alps, illustrated by numerous photographs, by Dr. Tempest Anderson, which are very finely reproduced.
- Alps—Glaciers.** *Mem. S.G. Italiana* 9 (1899): 143-177. **Marson.**
 Sui ghiacciai italiani del gruppo del Pizzo Bernina. Osservazioni del 1898 con l'aggiunta dei risultati di una rapida escursione ai principali ghiacciai svizzeri dello stesso gruppo. Nota del prof. Luigi Marson. *With Maps and Illustrations.*
- Alps—Simplon Tunnel.** *P.I. Civil Engineers* 140 (1900): 249-266. **Fox.**
 The Construction of the Simplon Tunnel. By C. B. Fox. *With Plans and Sections.*
- Austria—Bosnia and Herzegovina.** *Deutsche G. Blätter* 23 (1900): 97-108. **Bräss.**
 Reisebilder aus Bosnien und der Hercegovina. Von Dr. Martin Bräss.
- Austria—Tirol.** *Globus* 78 (1900): 62-63. **Jäger.**
 Steinach am Brenner. Von Julius Jäger.
- Austria-Hungary—Glaciers.** *Abh. k.k. G. Ges. Wien* 2 (1900): 91-119. **Böhm.**
 Die alten Gletscher der Mur und Mürz. Von Dr. August Böhm Edlen von Böhmersheim.
- Austria-Hungary—Limnology.** *Abh. k.k. G. Ges. Wien* 2 (1900): 121-127. **Penck.**
 Bemerkungen über alte und neue Lothungen im Hallstätter See. Von Dr. Albrecht Penck. *Also separate copy. Presented by the Author.*
- Austria-Hungary—Surveys.** *M. Militär-G.I.* 19 (1899): 166-216. **Lehrl.**
 Das Präcisions-Nivellement in der österreichisch-ungarischen Monarchie. Von Franz Lehrl. *With Map.*
 Die Fortsetzung des Präcisions-Nivellements, ausgeführt in Jahre 1899.
 This describes the methods of levelling, the different kinds of benchmarks, and the work done in 1899 in the levelling of Austria-Hungary.
- Austria-Hungary—Surveys.** *M. Militär-G.I.* 19 (1899): 145-165. **Netuschill.**
 Die astronomischen Gradmessungsarbeiten des k. u. k. militär-geographischen Institutes. Von Franz Netuschill.
- Balkan Peninsula.** *Ann. G.* 9 (1900): 359-372. **Cvijić.**
 La période glaciaire dans la péninsule des Balkans. Par M. J. Cvijić. *With Maps.*
 Summarizes the author's conclusions respecting the former glaciation of the Balkan peninsula.
- Balkan—Peninsula.** *Abh. G. Ges. Wien* 2 (1900): 1-93. **Cvijić.**
 Morphologische und glaciale Studien aus Bosnien, der Hercegovina und Montenegro. I. Theil: Das Hochgebirge und die Cañonthäler. Von Dr. Jovan Cvijić. *With Maps.*
 A valuable study of the physical history of a portion of the Balkan peninsula, based on the author's personal observations.
- Central Italy.** **Jeaffreson.**
 A Handbook for Travellers in Central Italy, including Tuscany, the Tuscan Islands, Umbria, the Marches, and part of the late Patrimony of St. Peter. Twelfth Edition. Rewritten by the Rev. Herbert H. Jeaffreson, M.A. London: John Murray, 1900. Size $7 \times 4\frac{1}{2}$, pp. xxxvi. and 314. *Maps and Plans.* Price 9s. *Presented by the Publisher.*
 This new edition of Central Italy appeals, like all the handbooks of this series, to the cultured traveller, and while treating fully of the artistic treasures of Florence and the other cities of the central belt, it is fluely equipped with good maps and practical hints to tourists.
- Europe—Geodesy.** **Weiss and Schram.**
 Publicationen für die Internationale Erdmessung. Astronomische Arbeiten des k.k. Gradmessungs-Bureau ausgeführt unter der Leitung des Hofrathes Theodor

- v. Oppolzer. Nach dessen Tode herausgegeben von Prof. Dr. Edmund Weiss und Dr. Robert Schram. XI. Band. Längenbestimmungen. Wien: F. Tempaky, 1899. Size $12\frac{1}{2} \times 10$, pp. x. and 274. *Presented by the K.K. Gradmessungs-Bureau, in Wien.*
- Europe—Historical.** *Aarb. Nord. Oldk. Historie* 15 (1900): 16-50. **Fabricius.**
Korstogo fra Norden til den spanske Halvø. Af A. Fabricius.
On early journeys from the Scandinavian to the Iberian peninsula.
- Europe—National Surveys.** *M. Militär-G.I.* 19 (1899): 257-282. **Haardt.**
Notizen über die organisation der militär-topographischen Arbeiten in den europäischen Staaten. Von Vincenz Haardt von Hartenthurn.
- France.** *B.S. Belge Geologie* 13 (1899): 85-206. _____
Compte rendu détaillé des excursions de la Session Extraordinaire Annuelle de la Société belge de Géologie, de Paléontologie et d'Hydrologie tenue du 15 au 21 août 1898 à Nancy et dans les Vosges. *With Map and Plates.*
- France—Colonization.** _____ **Zimmermann.**
Questions Dipl. et Colon. 9 (1900): 705-719; 10 (1900): 1-21.
Lyon et la Colonization française. Par M. le Prof. M. Zimmermann.
- France—Ethnology.** *Le Globe, B.S.G. Genève* 39 (1900): 95-107. **Pittard**
Note préliminaire sur l'ethnologie de la Savoie et de Haute-Savoie. Par M. le Dr. Eugène Pittard.
- France—Paris.** *Ann. G.* 9 (1900): 340-358. **Dupuy.**
Le sol et la croissance de Paris. Par M. Paul Dupuy. *With Maps.*
Shows the influence on the expansion of Paris of the relief of the soil as determined by the waters of the Quaternary period.
- France—Speleology.** *C. Rd.* 131 (1900): 130-132. **Martel.**
Sur de nouvelles constatations dans la rivière souterraine de Padirac (Lot). Note de M. E.-A. Martel.
- France—Surface features.** *C. Rd.* 131 (1900): 286-288. **Fabre**
Les ensablements du littoral gascon et les érosions sous-pyrénéennes. Note de M. L. A. Fabre.
- Germany.** _____ **Baedeker.**
Northern Germany as far as the Bavarian and Austrian Frontiers. Handbook for Travellers by Karl Baedeker. With 34 Maps and 65 Plans. Thirtieth revised edition. Leipzig: Karl Baedeker; London: Dulau & Co. 1900. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. xxxiv. and 430. Price 5m. *Presented by Messrs. Dulau & Co.*
- Germany—Baltic.** _____ **Westphal.**
Veröffentlichung des Königl. Preussischen Geodätischen Institutes. Neue Folge. No. 2. Das Mittelwasser der Ostsee bei Travemünde, Marienleuchte, Wismar, Warnemünde, Arkona und Swinemünde in den Jahren 1882-1897. Bearbeitet von Prof. Dr. A. Westphal. Berlin: P. Stankiewicz. 1900. Size $11\frac{1}{2} \times 9$, pp. 144. *Diagrams. Presented by the Institute.*
On the mean level of the water in the Baltic at various German ports, with tables of variations.
- Germany—Dunes.** *Globus* 78 (1900): 48-52. **Roth.**
Die deutschen Dünen und ihr Bau. Von Dr. E. Roth. *With Sketch-maps and Illustrations.*
Based on the official publication recently issued under the editorship of Paul Gerhardt.
- Germany—Ethnography.** _____ **Bremer.**
Ethnographie der germanischen Stämme. Von Otto Bremer. Strassburg: Karl J. Trübner, 1900. Size $10\frac{1}{2} \times 7$, pp. xii. and 216. *Maps. Price 6s.*
- Germany—Meteorology.** _____
Veröffentlichungen des K. Preussischen Meteorologischen Instituts. Ergebnisse der Gewitter-Beobachtungen im Jahre, 1897. Berlin: A. Asher & Co., 1899. Size $13\frac{1}{2} \times 10$, pp. xi. and 20. *Presented by the Institute.*
- Germany—Meteorology.** _____
Veröffentlichungen des K. Preussischen Meteorologischen Instituts. 1899. Heft ii. Ergebnisse der Beobachtungen an den Stationen ii. und iii. Ordnung im Jahre, 1899, zugleich Deutsches Meteorologisches Jahrbuch für 1899 Beobachtungssystem des Königreichs Preussen und benachbarter Staaten. Berlin: A. Asher & Co., 1900. Size $13\frac{1}{2} \times 10$, pp. 63-122. *Presented by the Institute.*

- Germany—Prussia.** *Naturw. Wochenschrift* 15 (1900): 337-343. **Brick.**
Die Provinz Westpreussen und ihre Naturdenkmäler. Von Dr. C. Brick.
Deals chiefly with the forestry of West Prussia.

- Germany—Prussia.** *Globus* 78 (1900): 59-61. **Hansen.**
Zur geographischen Verteilung der Personennamen Schleswig-Holsteins um 1500.
Von R. Hansen.

- Greece.** **Murray.**
Handbook for Travellers in Greece, including the Ionian Islands, Continental Greece, the Peloponnesus, the Islands of the Aegean, Thessaly, Albania, and Macedonia; and a detailed description of Athens, Ancient and Modern, Classical and Mediaeval. Seventh edition. London: John Murray, 1900. Size 7 x 4½, pp. cxx. and 992. *Maps, Plans, and Illustrations.* Price 20s. *Presented by the Publisher.*

- Holland.** **Various Authors.**
La Hollande, géographique, ethnologique, politique et administrative, religieuse, économique, littéraire, artistique, scientifique, historique, coloniale, etc. Par MM. François Bernard, C. H. B. Boot, Louis Bresson, E. Durand-Gréville, Maurice Enoch, A. Flæg, John Grand-Carteret, Antonin Lefèvre-Pontalis, Louis Legrand, Gustave Lejeal, Lieut.-Colon. Le Marchand, Adrien Mellion, Jan Suys, Jan Ten Brink, Louis Van Keymeulen, Zaborowski. Paris: Librairie Larousse [not dated]. Size 8½ x 6, pp. 461. *Illustrations.* Price 4s. 6d.

- Holland—Amsterdam.** **Robinson.**
Trade of Amsterdam for the year 1899. Foreign Office, Annual No. 2439. Size 10 x 6, pp. 12. Price 1d.

- Italy.** *B.S.G. Italiana* 1 (1900): 620-628. **Hassert.**
Tracce glaciali negli Abruzzi, nota preliminare del dott. Kurt Hassert. *With Plates.*
On traces of glacial formations in the Appennines.

- Italy—Alps.** *Mem. S.G. Italiana* 9 (1899): 25-81. **Novareso.**
Le Alpi Piemontesi, del Vittorio Novareso. *With Illustrations.*

ASIA.

- Afghanistan.** *J.E. India Assoc.* 32 (1900): 32-43. **Colquhoun.**
Afghanistan: the Key to India. By Archibald R. Colquhoun.

- Asia—Historical.** **Rockhill.**
The Journey of William of Rubruck to the Eastern Parts of the World, 1253-55, as narrated by himself, with two Accounts of the Earlier Journey of John of Pian de Carpine. Translated from the Latin, and edited, with an Introductory Notice, by William Woodville Rockhill. London: Printed for the Hakluyt Society, 1900. Size 9 x 6, pp. lvi. and 304. *Map.* *Presented by the Hakluyt Society.*

- Central and Western Asia.** *J. Bombay Br. R. Asiatic S.* 20 (1899): 217-233. **Modi.**
The Etymology of a few towns of Central and Western Asia as given by Eastern writers. By Jivanji Jamshedji Modi.

- China.** **Colquhoun.**
The "Overland" to China. By Archibald R. Colquhoun. London and New York: Harper & Bros., 1900. Size 9 x 6, pp. xii. and 466. *Portrait, Maps, and Illustrations.* Price 16s. *Presented by the Publishers.*

A timely volume dealing in an authoritative way with the conquest and settlement of Siberia, the Siberian-Manchurian railway, Peking past and present, Manchuria, Eastern Mongolia, the Yang-tze valley, South-West China, and Tongking.

- China.** **Colquhoun.**
The Problem in China and British Policy. By Archibald R. Colquhoun. London: P. S. King & Son, 1900. Size 7½ x 5, pp. 50. *Map.* Price 2s. *Presented by the Publishers.*

Urges the importance of securing for Great Britain a preponderating influence in the Yang-tze valley, from which as a centre whatever is possible of a reformed China should be built up. Some useful statistics as to trade, etc., are given. The map does not show the proposed railway of the Peking Syndicate.

China.**Förke**

Von Peking nach Ch'ang-an und Lo-yang. Eine Reise in den Provinzen Chihli, Shansi, Shensi und Honan. Von A. Förke.—Mittheilungen des Seminars für Orientalische Sprachen an der Universität zu Berlin. Jahrg. i. 1 Abt. pp. 1-126. Berlin and Stuttgart: W. Spemann, 1898. Size 10 × 7. *Maps and Illustrations.*

The journey took place in 1892.

China.*Ann. Hydrographie* 28 (1900): 289-292.**Lans**

Zur Küstenkunde von China. Aus dem Reiseberichte S.M.S. "Iltis," Kommandant Korv.-Kapt. Lans. *With Chart.*

China.**Pinon**

René Pinon Jean de Marcellac. La Chine qui s'ouvre. Paris: Perrin et C^e, 1900. Size 7½ × 5, pp. xii. and 306. *Maps. Price 2s. 8d.*

China.**Scidmore.**

China, the Long-Lived Empire. By Eliza Ruhamah Scidmore. London: Macmillan & Co., 1900. Size 8½ × 6, pp. xvi. and 466. *Illustrations. Price 8s. 6d. net. Presented by the Publishers.*

Miss Scidmore has seized a favourable moment for the production of her book on China, which is full of acute observations of land and people, and very well illustrated by drawings and photographs.

China—Chekiang.*B.S.G. Italiana* 1 (1900): 535-542.**Vannutelli**

Un' escursione nel Ce-kiang settentrionale. Lettera del L. Vannutelli. *With Plates.*

A recent journey described in a letter from Shanghai, dated February, 1900.

China—Chi-li.

Short Military Report on the Province of Chi-li. Compiled in the Intelligence Branch of the Quarter-Master General's Department, Simla. Simla, 1900. Size 10 × 6½, pp. 20. *Map and Plans. Presented by the Assistant Quarter-Master General, Intelligence Branch, Simla.*

This is a pamphlet compiled for the information of the British troops sent from India to carry on military operations against the "Boxers" in China.

China—Hangchow.**Clennel**

Trade of Hangchow for the year 1899. Foreign Office, Annual No. 2449, 1900. Size 10 × 6, pp. 20. *Price 1½d.*

China—Liao-tung.**Bretschneider**

The Russian Territory on the Liao-tung Peninsula. By E. Bretschneider. [In Russian.] St. Petersburg, 1900. Size 9½ × 6½, pp. 18. *Map. Presented by the Author.*

China—Pakhoi.**Nevill-Perkins**

Trade of Pakhoi for the year 1899. Foreign Office, Annual No. 2437, 1900. Size 10 × 6, pp. 20. *Map. Price 4½d.*

China—Railway.*Ann. G.* 9 (1900): 373-376.**Fauvel**

Le chemin de fer de Peking à Nicou-tchouang. Par M. A. A. Fauvel.

China—Swatow.**Hurst**

Trade of Swatow for the year 1899. Foreign Office, Annual No. 2443, 1900. Size 10 × 6½, pp. 12. *Price 1d.*

China—Yang-tse.*Globus* 78 (1900): 37-44.**Betz**

Ein Ausflug nach den Yangtze-Groten. Von Dr. H. Betz. *With Illustrations.*

A description of the Yang-tze gorges.

Eastern Asia.**Barthold.**

Russische Arbeiten über Ostasien. Von W. Barthold.—Mittheilungen des Seminars für Orientalische Sprachen an der Universität zu Berlin. Jahrgang i. 1 Abt. pp. 187-210. Berlin and Stuttgart: W. Spemann, 1898. Size 10 × 7.

Eastern Asia.**Daish.**

Melbourne to Tokio. Notes by the way. By W. Daish, M.D. Melbourne, 1900. Size 7½ × 5, pp. 104. *Frontispiece. Price 2s. 6d. Presented by the Author.*

Notes by a ship's surgeon on visits to ports in China and Japan.

Eastern Asia—Typhoons. *Ann. Hydrographiques* (1899): 61-198.**Algué**

Les cyclones aux Philippines et dans les mers de Chine. Étude théorique et pratique par le Père José Algué. *With Diagrams.*

French India.**Vismes.**

Trade of Pondicherry for the year 1899. Foreign Office, Annual No. 2440, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 10. *Price 1d.*

India—Archæology.*J.R. Asiatic S.* (1900): 431-437.**Smith.**

The Buddhist Monastery at Solnäg, in the Gorakhpur District. By Vincent A. Smith. *With Plans and Plate.*

New light has recently been thrown on the plan of these ruins by excavations to obtain bricks for railway ballast. The main building, which Mr. Smith thinks was undoubtedly a monastery, is 487 feet long.

India—Geological Survey.

General Report on the work carried on by the Geological Survey of India for the period from the 1st April, 1899, to the 31st March, 1900. Under the direction of C. L. Griesbach. Calcutta, 1900. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. iv. and 258. *Presented by the Geological Survey of India.*

India—Inscriptions.**Hultzsch.**

Archæological Survey of India, New Imperial Series, volume xxix. South-Indian Inscriptions. Volume iii. Miscellaneous Inscriptions from the Tamil Country. Part i. Inscriptions at Ukkal, Melpadi, Karuvur, Manimangalam, and Tiruvallam. Edited and translated by E. Hultzsch, PH.D. Madras, 1899. Size $13\frac{1}{2} \times 10$, pp. 124. *Illustrations.*

India—Kashmir.**Stein.**

Memoir on Maps illustrating the Ancient Geography of Kāśmīr. By M. A. Stein, PH.D. (Reprinted from the *Journal of the Asiatic Society of Bengal*, vol. lxviii. part i., Extra No. II., 1899.) Calcutta, 1899. Size $10\frac{1}{2} \times 7$, pp. xii. and 224. *Maps. Presented by the Author.*

This work deals first with the sources of our knowledge as regards ancient Kashmir, considering in turn the Greek, Chinese, Arabian, and Indian notices and the Kashmir chronicles. The general geography of Kashmir is then dealt with in detail, and historical changes in lakes and rivers placed on record. Finally, the political geography of ancient Kashmir is worked out with special reference to the boundaries of the subdivisions of the country.

India—Madras.**Walker.**

A Geological Sketch of the Central Portion of Jeypore Zemindari, Vizagapatam District. By T. L. Walker.—General Report, Geological Survey of India, 1899-1900. Pp. 166-176.

AFRICA.**Abyssinia.***La G., B.S.G. Paris* (1900): 25-34.**Michel.**

Resultats géographiques de la mission de Bouchamps. Par M. Ch. Michel. *With Map and Illustrations.*

British East Africa.**Gorges.**

A Journey from Lake Naivasha to the Victoria Nyanza. By Captain G. H. Gorges. (From the *Geographical Journal* for July, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 12. *Map and Illustrations.*

British East Africa.**Purvis.**

Handbook to British East Africa and Uganda. By John B. Purvis. London: Sonnenschein & Co., 1900. Size $7\frac{1}{2} \times 5$, pp. viii. and 94. *Maps and Illustrations. Two copies, one presented by the Author, the other by the Publishers.*

A practical little book giving concise notes as to the nature of the countries, climates, peoples, and products of British East Africa, and lists of outfits suited for use in Uganda.

British East Africa—Zanzibar.**Neuhaus.**

Der Obstreichthum der Insel Zanzibar. Von G. Neuhaus.—Mittheilungen des Seminars für Orientalische Sprachen an der Universität zu Berlin. Jahrgang I. 3 Abt. pp. 120-137. Berlin and Stuttgart: W. Spemann, 1898. Size 10×7 .

On fruit cultivation in Zanzibar island.

British South Africa.

The British South Africa Company. Reports on the Administration of Rhodesia, 1897-1898. 1899. Size $10\frac{1}{2} \times 8\frac{1}{2}$, pp. 406. *Maps.*

Canary Islands.

Croker.

Trade of the Canary Islands for the Year 1899. Foreign Office, Annual No. 2451, 1890. Size 10 x 6½, pp. 14. Price 1d.

Cape of Good Hope.

Gill.

Report of Her Majesty's Astronomer at the Cape of Good Hope to the Secretary of the Admiralty, for the year 1899. London, 1900. Size 12½ x 10, pp. 18.

See note, p. 474.

East Africa—Place-names.

Velten.

Erklärung einiger ostafrikanischer Ortsnamen. Von C. Velten.—Mittheilungen des Seminars für Orientalische Sprachen an der Universität zu Berlin. Jahrgang i. 3 Abt. pp. 199-204. Berlin and Stuttgart: W. Spemann. Size 10 x 7.

Explanation of the meaning of a number of East African place-names.

East Africa—Swahili.

Velten.

Sitten und Gebräuche der Suaheli. Von C. Velten.—Mittheilungen des Seminars für Orientalische Sprachen an der Universität zu Berlin. Jahrgang i. 3 Abt. pp. 9-85. Berlin and Stuttgart: W. Spemann, 1898. Size 10 x 7.

Egypt.

Ebers.

Aegyptische Studien und Verwandtes. Von Georg Ebers. Stuttgart und Leipzig, Deutsche Verlags-Anstalt, 1900. Size 10 x 6½, pp. x. and 518. Portrait. Price 8s.

A collection of articles by the late celebrated Egyptologist, including chapters on Egyptian excavations, ancient Egyptian literature, a chapter on modern Egypt, and biographies of Johannes Dümichen, Sir P. Le Page Renouf and the Khedive Ismail. A catalogue of Herr Ebers' writings concludes the volume.

Egypt—Census.

Recensement Général de l'Égypte, 1^{er} Juin 1897—1^{er} Moharrem 1315. Résultats généraux. Le Caire, 1898. Size 15 x 11, pp. 70.

Egypt—Nile.

J. Manchester G.S. 15 (1899): 193-200.

Bowes.

Barrage of the Nile. By Alderman Isaac Bowes.

Egypt and the Sudan.

Egypt. No. 1 (1900). Reports by Her Majesty's Agent and Consul-General on the Finances, Administration, and Condition of Egypt and the Soudan in 1899. London: Eyre and Spottiswoode, 1900. Size 13 x 8½, pp. iv. and 62. Price 6½d.

Referred to in the *Journal* for July (*ante*, p. 102).

French Somaliland.

C. Rd. 131 (1900): 196-198.

Gennes and Bonard.

Les roches volcaniques du Protectorat des Somalis. Note de MM. A. de Gennes et A. Bonard.

French West Africa.

Payeur-Didelot.

Trente Mois au Continent Mystérieux. Gabon-Congo et Côte Occidentale d'Afrique. Par Payeur-Didelot. Préface de J.-V. Barbier. Paris: Berger-Levrault & C^{ie}, 1899. Size 9 x 6, pp. xii. and 404. Price 5 fr.

This little book contains a great many details regarding the people and products of Gabon and French Congo, with notes on the other French possessions on the West African coast.

French West Africa—Niger. La G., B.S.G. Paris (1900): 9-24.

Baillaud.

Les territoires français du Niger. Leur valeur économique. Par M. E. Baillaud. With Map and Illustrations.

German East Africa.

Stierling.

Die Königsgräber der Wahehe. Von J. Stierling.—Mittheilungen des Seminars für Orientalische Sprachen an der Universität zu Berlin, Jahrgang ii. 3 Abt. pp. 257-262. Berlin and Stuttgart: W. Spemann, 1899. Size 10 x 7. Illustrations.

German East Africa—Kilimanjaro.

Widenmann.

Eine Kilimandscharo-Besteigung bis zu 5500 m. Höhe, von A. Widenmann.—Mittheilungen des Seminars für Orientalische Sprachen an der Universität zu Berlin, Jahrgang ii. 3 Abt. pp. 140-163. Berlin and Stuttgart: W. Spemann, 1899. Size 10 x 7. Illustrations.

The ascent here described was made in September, 1895.

German South-West Africa.

Brincker.

Die Eingeborenen Deutsch-Südwest-Afrikas nach Geschichte, Charakter, Sitten, Gebräuchen und Sprachen (1 Theil). Von P. H. Brincker.—Mittheilungen des

Seminars für Orientalische Sprachen an der Universität zu Berlin. Jahrgang ii. 3 Abt. pp. 125-139. Berlin and Stuttgart: W. Spemann, 1899. Size 10 x 7.
On the people of South-West Africa.

NORTH AMERICA.

Alaska. *Norske G. Selsk. Aarbog* 10 (1898-99): 14-81. **Moe.**
Minder fra Alaska af ingeniør Ole Falk Moe. *With Map and Illustrations.*

American Lakes. **Erskine.**
Shipping and Shipbuilding on the American Lakes. Foreign Office, Miscellaneous, No. 526, 1900. Size 9½ x 6, pp. 26. *Price 2d.*

Referred to in the September number of the *Journal* (p. 353).

Canada. **Hanbury.**
A Journey from Chesterfield Inlet to Greet Slave Lake, 1898-99 By David T. Hanbury. (From the *Geographical Journal* for July, 1900.) Size 10 x 6½, pp. 16. *Map.*

Canada—Geological Survey.
Summary Report of the Geological Survey Department for the year 1899. Ottawa, 1900. Size 10 x 6½, pp. 224. *Map.*

Among the special reports included in this summary are those of Mr. McConnell on the Yukon district (already issued separately); of Mr. Gwillim, on the Atlin district of British Columbia; and of Mr. A. P. Low, on exploration of the East Coast of Hudson bay. A large amount of useful geographical information is contained in them. The map shows the Yukon goldfields on the scale of 2 miles to 1 inch.

Canada—Gulf of St. Lawrence.
The Currents in the Gulf of St. Lawrence, including the Anticosti Region, Belle Isle and Cabot Straits. Condensed from the Reports of the Survey of Tides and Currents, for the seasons of 1894, 1895, and 1896. Ottawa, 1900. Size 10 x 6½, pp. 28.

Canada—La Hontan's Journeys. **Nion.**
Un outre-mer au XVII^e siècle, voyages au Canada du Baron de La Hontan. Publiés avec une Introduction et des notes. Par M. François de Nion. Paris: Plon-Nourrit et C^{ie}, 1900. Size 7½ x 5, pp. xx. and 338. *Price 2s. 8d.*

Letters written from Canada in 1684 and 1685, describing the exploration of the interior of the country.

Canada—Minerals. **Dawson.**
Paris International Exhibition, 1900. Economic Minerals of Canada. By G. M. Dawson, c.m.g. Printed by direction of the Canadian Commission for the Exhibition, 1900. Size 8 x 4½, pp. 54. *Map.*

Canada—Surveys and Museums. *P. Canadian* I. 2 (1900): 75-89. **Walker.**
Canadian Surveys and Museums, and the need of increased expenditure thereon. President's address. By B. E. Walker.

Mexico.
Mexico. A geographical sketch, with special reference to Economic Conditions and Prospects of Future Development. Compiled by the Bureau of the American Republics. Washington, 1900. Size 9½ x 6, pp. 386. *Presented by the Bureau of the American Republics.*

A most useful summary of our knowledge of Mexico, under the heads of geography, history, ethnology, government, agriculture, industries, commerce, etc. There is a fairly complete catalogue of modern works and maps on Mexico.

Mexico—Folklore. **Starr.**
Catalogue of a Collection of Objects illustrating the folklore of Mexico. By Frederick Starr. London: Published for the Folklore Society by David Nutt, 1899. Size 9 x 6, pp. xvi. and 132. *Illustrations. Presented by the Publisher.*

The collection here described, which illustrates divers phases of Mexican life, was presented by Mr. Starr to the Folk-lore Society.

North America—Geology. **Weeks.**
B. U.S. Geol. Surv., No. 156 (1898): 1-130; No. 162 (1899): 1-164.

Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy for the years 1897 and 1898. By F. B. Weeks.

United States—Altitudes. *B.U.-S. Geolog. Surv.*, No. 160 (1899): 1-776. **Gannett.**
A Dictionary of Altitudes in the United States. (Third edition.) Compiled by Henry Gannett.

The purely geographical grouping of the points of which the height above sea-level is known which was adopted in the previous edition of this list has been abandoned, and the alphabetical order restored in the present. Now the list is given alphabetically under each state, the names of the states being also arranged in alphabetic order.

United States—California. **Perrine.**
B.U.-S. Geolog. Surv., No. 155 (1898): 1-46; No. 161 (1899): 1-30.
Earthquakes in California in 1896 and 1897, and 1898. By C. D. Perrine.

United States—Geology. *B.U.S. Geolog. Surv.*, No. 150 (1898): 1-400. **Diller.**
The Educational Series of Rock Specimens collected and distributed by the United States Geological Survey. By J. S. Diller. *With Illustrations.*

United States—Illinois. **Leverett.**
The Illinois Glacial Lobe. By Frank Leverett. (Monographs of the United States Geological Survey. Vol. xxxviii.) Washington, 1899. Size 12 x 9½. pp. xxii. and 818. *Maps and Illustrations. Presented by the U.S. Geological Survey.*

United States—Iowa. **James.**
Constitution and Admission of Iowa into the Union. By James Alton James, Ph.D. (Johns Hopkins University Studies. Series xviii. No. 7.) Baltimore, 1900. Size 9½ x 6½. pp. 54.

United States—Irrigation. **Mead.**
Rise and Future of Irrigation in the United States. By Elwood Mead.—Yearbook of the United States Department of Agriculture, 1899. Washington, 1900. Size 9½ x 6. pp. 591-612. *Illustrations. Presented by the U.S. Department of Agriculture.*

This paper traces the history of irrigation in the western states, describes the work now being carried on, and discusses future developments.

CENTRAL AND SOUTH AMERICA.

Argentine Republic.
Anuario de la Direccion General de Estadistica correspondiente al Año 1898. Tomo I. Buenos Aires, 1899. Size 11 x 7½. pp. xxviii. and 494.
Exhaustive statistics of the commerce and shipping of Argentina.

Bolivia. *National G. Mag.* 11 (1900): 209-224, 264-280. **Curtis.**
The Road to Bolivia. By William E. Curtis. *With Illustrations.*

Brazil—Amazon. *J. Manchester G.S.* 15 (1899): 185-192. **Jones.**
A Thousand Miles up the Amazon. By Joseph Jones. *With Illustrations.*

Brazil—Discovery.
Instituto Geographico e Historico da Bahia. Revista commemorativa do Quarto Centenario do Brazil. Anno VII. vol. vii. No. 23. Bahia, 1900. Size 9½ x 6½. pp. 78. *Map. Presented by the Institute.*

Brazil—Porto Alegre. **Archer.**
Trade of Porto Alegre for the year 1899. Foreign Office. Annual No. 2454, 1900. Size 10 x 6½. pp. 14. Price 1d.

Brazil—Trombetas. **Coudreau.**
O. Coudreau. Voyage au Trombetas 7 Août 1899—25 Novembre 1899. Paris: A. Lahure, 1900. Size 11½ x 9. pp. 142. *Maps and Illustrations. Price 6s. 6d.*

This work describes the last and fatal journey of the well-known explorer Henri Coudreau, who, between 1895 and his death in 1899, had devoted himself to the exploration of the Amazon tributaries in the State of Para, including the Tapajos and Xingu, as well as the Tocantins and Araguaya. The illustrations, from photographs, give an excellent idea of Brazilian river scenery, and the large-scale charts of the Trombetas and its branches are a valuable addition to our knowledge of that imperfectly known stream. The author was second in command of the expedition.

Chile. *Ann. Hydrographic* 28 (1900): 292-293. **Herrmann.**
Valparaiso. Bearbeitet durch J. Herrmann. *With Plan.*

- Cuba—Census.** *B. American G.S.* 32 (1900): 281-286. **Gannett.**
 The Results of the Cuban Census. By Henry Gannett.
 The United States census of Cuba in October, 1899, showed a total population of 1,573,000; the last Spanish census in 1887 gave 1,632,000.
- Danish West Indies.** *Export* 22 (1900): 412-414. _____
 Dänemarks westindische Besitzungen.
- Ecuador—Degree measurement.** *La G., B.S.G. Paris* (1900): 1-8. **Maurain.**
 Reconnaissance de l'arc du méridien de Quito. Par M. E. Maurain. *With Map and Illustrations.*
- Ecuador—Degree measurement.** *C. Rd.* 131 (1900): 215-236. **Poincaré.**
 Rapport sur le projet de revision de l'arc meridien de Quito. Par M. Poincaré. *With Map.*
 These two articles are referred to, *ante*, p. 356.
- Paraguay—Chaco Boreal.** *Scottish G. Mag.* 16 (1900): 418-429. **Grubb.**
 The Chaco Boreal: the Land and its People. By W. Barbrooke Grubb.
 Mr. Grubb has spent eleven years in the northern Chaco as a missionary, and gives a full and interesting account of the general characteristics of the country and people.
- Peru.** _____
 Sinopsis geográfica y estadística del Peru, 1895-1898. Lima, 1899. Size 11 × 7½, pp. 208.
- Peru.** **Cisneros and Garcia.**
 Carlos B. Cisneros, Rómulo E. Garcia, El Perú en Europa. Lima: Guzman, 1900. Size 7½ × 5½, pp. x. and 104.
 A description of Peru and its resources, designed to show the attractions which that country may present to European immigrants.
- Porto Rico.** *B. American G.S.* 32 (1900): 220-238. **Wilson.**
 Porto Rico: its Topography and Aspects. By Herbert M. Wilson. *With Map.*
 The author accompanied Mr. R. T. Hill as topographer in his geological reconnaissance of the island.
- West Indies—Dudley's Voyage.** **Warner.**
 The Voyage of Robert Dudley, afterwards styled Earl of Warwick and Leicester and Duke of Northumberland, to the West Indies, 1594-1595, narrated by Capt. Wyatt, by himself, and by Abram Kendall, Master. Edited by George F. Warner. London: Printed for the Hakluyt Society, 1899. Size 9 × 6, pp. lxxvi. and 104. *Portrait and Map. Presented by the Hakluyt Society.*

AUSTRALASIA AND PACIFIC ISLANDS.

- Caroline Islands.** *M.G. Ges. Hamburg* 16 (1900): 71-138. **Kubary.**
 Beitrag zur Kenntniss der Nukuoro oder Monteverde-Inseln (Karolinen). Von J. Kubary. *With Illustrations.*
- Melanesia.** **Chewings.**
 Amongst Tropical Islands; or, Notes and Observations made during a visit of the s.s. *Moresby*, in 1899, to New Guinea, New Britain, and the Solomon Islands. By a Passenger (Hannah Chewings). Adelaide: J. L. Bonython & Co., 1900. Size 7½ × 5, pp. 36. *Presented by the Author.*
 A reprint of letters originally contributed to a newspaper.
- New South Wales.** **Carne.**
 New South Wales. Mineral Resources, No. 7. Mercury, or "Quicksilver," in New South Wales, with Notes on its Occurrence in other Colonies and Countries. By J. E. Carne. Sydney, 1900. Size 10 × 6½, pp. 36. *Sketch-Map and Plan. Presented by the Geological Survey, New South Wales.*
- Samoa.** *Globus* 78 (1900): 31-33. **Bülow.**
 Die Namen der Samoa-Inseln. Von W. V. Bülow. *With Illustration.*
 On the various names which have from time to time been applied to the Samoa islands.

POLAR REGIONS.

- Antarctic.** *Globus* 77 (1900): 345-352, 365-371. **Schott.**
 Die deutsche Tiefsee-Expedition auf dem Dampfer *Valdivia* im südlichen Eismeer. Von Dr. Gerhard Schott. *With Map and Illustrations.*

Antarctic—Belgian Expedition. *B.S.R. Belge G. 24* (1900): 93-175. **Arctowski.**
Géographie physique de la région antarctique visitée par l'Expédition de "la Belgica." Par Henryk Arctowski. *With Maps and Illustrations.*

Antarctic—Belgian Expedition. *B.S.R. Belge G. 24* (1900): 29-52. **Lecointe.**
Aperçu des travaux scientifiques de l'Expédition antarctique belge. Par M. Georges Lecointe. *With Illustrations.*

Antarctic—Belgian Expedition. *B.S.R. Belge G. 24* (1900): 53-92. **Lecointe.**
L'hydrographie dans le détroit de la "Belgica" et les observations astronomiques et magnétiques dans la zone australe. Par M. Georges Lecointe. *With Illustrations.*

Antarctic—Belgian Expedition. *B.S.R. Belge G. 24* (1900): 7-28. —
Expédition antarctique belge. *With Illustrations.*

The whole of the January—February number of this *Bulletin* is occupied by a report of the *Belgica* expedition, including the separate reports of each member of the staff on his particular work.

Antarctic—Biology. *B.S.R. Belge G. 24* (1900): 177-230. **Racovitz.**
La vie des animaux et des plantes dans l'Antarctique. Par Emile G. Racovitz. *With Illustrations.*

Arctic—Peary's Expedition. *B. American G.S. 32* (1900): 245-248. **Bridgman.**
Mr. H. L. Bridgman on Peary's Work.

A summary of the trip of the *Diana* with supplies to Mr Peary in 1899, with notes of his proposed plan of action for 1900.

Greenland. **Nathorst.**
Den svenska expeditionen till nordöstra Grönland 1899. Af A. G. Nathorst. (Ur *Ymer*, Årg. 1900, H. 2.) Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 115-156. *Maps and Illustrations. Presented by the Author.*

MATHEMATICAL GEOGRAPHY.

Azimuth Tables—Star. **Davis.**
Star's True Bearing or Azimuth Tables, computed for intervals of ten minutes between the Parallels of Latitude 30° and 60° inclusive. By Percy L. H. Davis. London: J. D. Potter, 1900. Size $9\frac{1}{2} \times 6$, pp. 108. Price 6s. *Presented by the Author.*

Azimuth Tables—Sun. **Davis.**
Sun's True Bearing or Azimuth Tables, computed for intervals of four minutes between the Parallels of Latitude 30° N. and 30° S. inclusive, with Instructions for using the Tables in Danish, Dutch, French, German, Italian, Portuguese, Russian, and Spanish. By Captain John E. Davis and Percy L. H. Davis. London: J. D. Potter, 1900. Size $9\frac{1}{2} \times 6$, pp. xxvi. and 256. Price 10s. 6d. *Presented by the Author.*

Cartography. **Lamprecht and Kötzschke.**
Ueber Historische Grundkarten. A. Zur Organisation der Grundkartenforschung, von Karl Lamprecht. B. Die Technik der Grund-Karteneinzeichnung, von Rudolf Kötzschke. Sonderabdruck aus Deutsche Geschichtsblätter, Monatschrift zur Förderung der landesgeschichtlichen Forschung, herausgegeben von Dr. Armin Tille. (Heft 2, November 1899 und Heft 5, Februar 1900.) Gotha, F. A. Perthes, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 30. Price 9d.

Proposal for a map of Germany on the scale of 1: 100,000, showing by a great variety of signs the nature of the population centres, boundaries of ecclesiastical as well as political divisions, the nature of the proprietorship, and method of cultivation of the land, etc.

Cartography. —
Table des Légendes latines, hollandaises et italiennes d'un Atlas Ancien contenant des Cartes hydrographiques et géographiques du xvi^e et du xvii^e siècles. Avec des traductions française, Anglaise et castillane. Blanes, 1900. Size $9 \times 6\frac{1}{2}$, pp. 40. *Presented.*

Cartography—War Maps. *J.R. United Service I. 44* (1900): 758-776. **Holdich.**
War Maps. By Colonel Sir T. H. Holdich, K.C.I.E.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

- Aurora.** Arctowski.
Observations on the Aurora Australis. By Henryk Arctowski. (From the *Geographical Journal* for July, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 4.
- Biology.** *Quarterly Rev.* 192 (1900): 199-216.
New Creatures for Old Countries.
On acclimatisation, chiefly with reference to the experiments carried on at Haggerstone Castle, Leonardslee, and Woburn Abbey. The herds of deer, etc., at the last-named are described as a spectacle never to be forgotten, only to be compared with those seen in East Africa.
- Botanical Geography.** *La G., B.S.G. Paris* (1900): 35-40. Masclef.
La Géographie botanique et son évolution au XIX^e siècle. Par M. A. Masclef.
- Climatological Maps.** *Meteorolog. Z.* 17 (1900): 241-257. Meinardus.
Eine einfache Methode zur Berechnung klimatologischer Mittelwerthe von Flächen. Von Dr. Wilh. Meinardus.
On the calculation of mean values of climatological data for surfaces.
- Geomorphology.** *B.S.G. Italiana* 1 (1900): 522-534, 601-619. Borzino.
Valli aperte, frammenti di geografia fisica e sociale del colonnello C. Borzino. *With Map.*
- Geomorphology.** *Mem. S.G. Italiana* 9 (1899): 3-24. Porena.
Della Morfologia della superficie terrestre nella Geografia e dei tipi di rilievo colla nomenclatura in italiano. Del Prof. F. Porena.
This paper discusses the nomenclature of terrestrial features and the terminology of processes, suggesting suitable Italian forms for the foreign words in use in other countries.
- Glacial Deposits.** *M.G. Ges. Hamburg* 16 (1900): 139-230. Petersen.
Geschlebestudien. Beiträge zur Kenntniss der Bewegungsrichtungen des diluvialen Inlandeises. Von Dr. Johannes Petersen. Zweiter Theil. *With Maps.*
- Meteorology at Sea.** *Ann. Hydrographiques* (1899): 21-29.
Note sur le dépouillement des journaux météorologiques des bâtiments de commerce (année 1898).
The names of the ships and their captains, from whose records meteorological observations are sent to the French Ministry of Marine, are here recorded, together with the name of the five best observers to whom the French Government has awarded prizes for the excellence of their work.
- Meteorology—Cyclones.** *B. American G.S.* 32 (1900): 249-259. Cordeiro.
Tropical Hurricanes. By F. J. B. Cordeiro. *With Diagrams.*
- Meteorology—Cyclones.** *C. Rd.* 131 (1900): 132-135. Poincaré.
Combinaison des effets des révolutions synodique et tropique de la Lune: son action sur la marche des dépressions. Note de M. A. Poincaré.
- Meteorology—Earth Temperature.** Homén.
Öfversigt Finska Vet.-S. Förhandlingar 40 (1897-98): 80-107.
Om jordtemperatur bestämningar. Af Theodor Homén.
On methods of earth-thermometry, and results in different soils in Finland.
- Meteorology—Pressure.** *Meteorolog. Z.* 17 (1900): 257-274. Fischer.
Ein neues Barometer. Von Dr. K. T. Fischer.
This new form of barometer is on the principle of the Cartesian Diver, and takes the form of an "atmospheric-pressure areometer." The instrument is described in minute detail.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

- Anthropology.** Deniker.
Les Races et les Peuples de la Terre, Éléments d'Anthropologie et d'Ethnographie. Par J. Deniker. Paris: Schleicher Frères, 1900. Size $7\frac{1}{2} \times 5$, pp. vi. and 692. *Illustrations.* Price 10s. 6d.
A clearly expressed and amply illustrated sketch of the main facts regarding the classification and the characteristics of the human race.

- Commercial Geography.** *Deutsche G. Blätter* 23 (1900): 77-96. **Fulst.**
Kohlenstationen und Flottenstützpunkte. Von Dr. O. Fulst.
On coaling and naval stations.
- Commercial Geography—Tea.** *J.S. Arts* 43 (1900): 668-671. ———
The Geography of Tea.
Extracts from an anonymous paper in the *Tropical Agriculturist* of Ceylon.
- Historical—De Quiros.** *B.G.S. Australasia (Victoria)* 18 (1900): 7-20. **Bevan.**
Did De Quiros land in Queensland? A Reply to Cardinal Moran. By Theodore F. Bevan.
This is referred to in the *Journal*, p. 479.
- Historical—Egyptian Text.** *P.S. Biblical Archaeology* 23 (1900): 155-160. **Wiedemann.**
A Mythological-Geographical Text. By Prof. Dr. A. Wiedemann.
On an old Egyptian religious text containing some remarks on the early conceptions of geography.
- Historical—Marco Polo.** *Le Globe, R.S.G. Genève* 39 (1900): 84-94. **Chaix.**
Marco Polo. Par M. Paul Chaix.
- Historical—Papal Demarcation.** **Dawson.**
The Lines of Demarcation of Pope Alexander VI. and the Treaty of Tordesillas, A.D. 1493 and 1494. By Samuel Edward Dawson. (From the *Transactions* of the Royal Society of Canada. Second Series—1899-1900. Vol. v. Section ii.) Ottawa: J. Hope & Sons, 1899. Size 10 x 6½, pp. 467-546. *Maps.*
This discusses the famous lines of demarcation between the spheres of Spanish and Portuguese influence from the points of view of historical fact and international law.
- Historical Maps.** ———
Die wechselnden Phasen im geschichtlichen Sehkreis occidentalischer Cultur. Kartographisch skizziert mit einleitendem Text. I. Berlin: D. Reimer (Ernst Vohsen), 1900. Size 10 x 6½, pp. 30. *Maps.* Price 1s. 6d.
A series of small maps showing the gradual growth of the area in which inter-communication of different peoples from the centres of Western culture was practicable at various historical periods.

BIOGRAPHY.

- Baumann.** *Abh. k.k. G. Ges. Wien* 2 (1900): 1-20. **Haberlandt.**
Dr. Oskar Baumann. Ein Nachruf. Von Dr. M. Haberlandt. *With Portrait.*
- Biographical Dictionary.** **Lee.**
Dictionary of National Biography. Edited by Sidney Lee. Vol. lxiii. Wordsworth-Zuylenstein. London: Smith, Elder & Co., 1900. Size 10 x 7, pp. xxiv. and 436. Price 15s. Also Indexes to vols. i. to xiv.
The following names of geographical interest are included among the notices in this volume: Sir Richard Worsley, by Warwick Wroth; Edward Wright, by Prof. J. K. Laughton; James Wild, by G. le Grys Norgate; Thomas Wyndham, by A. F. Pollard; Sir Henry Yule, by Countess Trotter. The splendid undertaking now completed forms a monument to British enterprise, as well of the living publishers and editors as of the famous dead whose biographies it enshrines.
- Champlain.** **Gravier.**
Gabriel Gravier. Vie de Samuel Champlain, fondateur de la Nouvelle-France (1567-1635). Paris: J. Maisonneuve & Co., 1900. Size 9 x 7, pp. xxvi. and 374. *Map and Portrait.* Price 16s.
Biography of the great French explorer, with details of his journeys of exploration and of the foundation of the French colonies on the St. Lawrence.
- Dampier.** **Verbeek.**
Deutsche G. Blätter 22 (1899): 203-235; 23 (1900): 28-58, 109-142.
William Dampiers Leben und Werke. Von Dr. Paul Verbeek.
- d'Escuras de Lanture.** **Durand-Lapie.**
Le Comte d'Escuras de Lanture, voyageur et explorateur français. Commandeur de la Légion d'honneur. Sa vie et ses ouvrages par Paul Durand-Lapie. Paris: H. Champion, 1899. Size 9 x 6, pp. 180. *Presented by the Author.*

- Feilden.** *Geolog. Mag.* 7 (1900): 289-294. **Bonney.**
Colonel Feilden's Contributions to Glacial Geology. By Prof. T. G. Bonney, D.Sc., etc.
- Marinelli.** *B.S.G. Italiana* 1 (1900): 629-654. **Vedova.**
Giovanni Marinelli. Commemorazione letta il 14 giugno 1900 dal Prof. G. Dalla Vedova. *With Portrait.*
This appreciative biography of Prof. Marinelli concludes with a list of 210 papers contributed by him to various journals from 1867 to 1899.

GENERAL.

- Bibliography.** **Knox.**
Geographical Index (Extra-European) to Books, Periodicals, etc. Compiled in the Intelligence Division, War Office, by Alexander Knox. 1899. With Index of Names for the years 1895-99. London: Harrison & Sons. Size 11 x 7½, pp. cx. and 92. *Presented by the War Office.*
- British Empire.** *National G. Mag.* 11 (1900): 249-263. **Mead.**
The Expansion of England. By Edwin D. Mead, LL.D.
- Church Missionary Society.**
Proceedings of the Church Missionary Society for Africa and the East. 1899-1900. London: Church Missionary House, 1900. Size 8½ x 6, pp. xcvi., 518, and (436). *Maps. Presented by the Church Missionary Society.*
Maps are given showing all the stations of the Church Missionary Society and the boundaries of the dioceses of the missionary bishops.
- Field Testing.** **Merritt.**
Field Testing for Gold and Silver. A practical Manual for Prospectors and Miners. By Wm. Hamilton Merritt. London: Crosby Lockwood & Son, 1900. Size 6 x 4, pp. x. and 144. *Illustrations. Price 5s. net. Presented by the Publishers.*
A compact and clearly printed pocket-guide for field work in the detection of precious metals, designed for the use of prospectors.
- Foreign Missions.**
Free Church of Scotland. Seventieth Report on Foreign Missions to the General Assembly of the Free Church of Scotland. May, 1900. Edinburgh, 1900. Size 8½ x 5½, pp. 112.
- French Colonies.** **Vignon.**
L'exploitation de notre Empire colonial. Par Louis Vignon. Paris: Hachette et C^e, 1900. Size 7½ x 5, pp. 356. *Price 3.50 fr.*
Discusses the principles and methods of French colonization by the action of the Government in every detail, and contrasts it unfavourably with the results of individual enterprise as shown in the British colonies.
- German Colonies.**
Jahresbericht über die Entwicklung der Deutschen Schutzgebiete im Jahre 1897-98. (Beilage zum Deutschen Kolonialblatt 1899.) Berlin, 1899. Size 12½ x 9, pp. 218.
- German Colonies.**
Jahresbericht der Deutschen Kolonialgesellschaft. 1899. Berlin, 1900. Size 9½ x 6½, pp. 76.
- German Colonies.**
Weissbuch. Zwanzigster Theil. Berlin: C. Heymann, 1900. Size 13 x 9½, pp. 318.
Progress reports for 1898-99 on the various German colonies in Africa and the Pacific, with statistics of trade, agriculture, etc.
- German Colonies.** **Hauser.**
Études d'Économie Coloniale. Premier fascicule. Colonies Allemandes, impériales et spontanées. Par Henri Hauser. Paris: Nony et C^e, 1900. Size 9 x 6, pp. x. and 142.
A reprint, with corrections and additions, of articles which originally appeared in *Questions Diplomatiques et Coloniales*. The author regards Kiau-chou as the most favourably placed of all the German possessions.

atlas, which has been in progress for years past. The map is printed in colours, and is on the scale of 1 : 100,000, while the larger maps previously issued were on the scale of 1 : 25,000. It is accompanied by a volume of explanatory letterpress.

ASIA.

Indian Government Surveys.

Surveyor-General of India.

Indian Atlas, 4 miles to an inch. Sheets: 15, parts of districts Rawal Pindi, Jhelum, Kohat, Bannu, Dera Ismail Khan, and Shapur (Punjab), additions to 1897; 17, district Multan and parts of districts Muzaffargarh, Jhang, Dera Ghazi Khan, Dera Ismail Khan, and Montgomery; parts of native states of Bahawalpur (Punjab), and Bikaner (Rajputana Agency), additions to 1898; 61, parts of districts Malabar, Coimbatore, Madura, and Salem (Madras Presidency), and of district Mysore (Mysore Native State) and Coorg, additions to 1899; 88, districts Jaunpur and parts of districts Allahabad, Azamgarh, Benares, Fatehpur, Mirzapur, and Banda (N.W. Provinces), districts Rae Bareilly, Partabgarh, and Sultanpur (Oudh), additions to 1898; 116, parts of districts Katak, Puri, and Tributary States of Baramba, Nayagur, Ranpur, Tigiria, etc. (Bengal), additions to 1899; 106, part of district Sambalpur and Garhjat States of Raigarh, Sarangarh, Sonpur, Rairakhol, and Bamra (Central Provinces), and Baud, Athmalik, and Angul (Orissa Tributary States), additions to 1898. Quarter-Sheets: 31 s.e., parts of districts Hissar and Ferozepur and Native States of Patiala (Punjab) and Bikaner (Rajputana Agency), additions to 1898; 31 s.w., parts of district Ferozepur and Native States of Bahawalpur (Punjab) and Bikaner (Rajputana Agency), 1898; 48 n.w., parts of districts Umballa, Ludhiana, and Karnal, and of Patiala, Nabha, Jind, Maler Kotla, and Kalsia Native States (Punjab), additions to 1897; 48 s.w., parts of districts Hissar and Karnal and Native States of Patiala and Jind (Punjab), 1899; 52 n.e., parts of districts Sangor (Central Provinces), Jhansi (N.W. Provinces), and of Native States of Gwalior (C. I. Agency), Tonk, and Jhallawar (Rajputana Agency), 1899; 70 s.e., parts of districts Damoh and Jabulpore (Central Provinces), and of Native States Panna, Ajaigarh, and Maihar (C. I. Agency), 1899; 70 s.w., parts of districts Sangor and Damoh (Central Provinces), Jhansi (N.W. Provinces), and of Native States Gwalior, Bhopal, and Panna (C. I. Agency), 1898; 71 s.w., parts of districts Narsinghpur, Hoshangabad, Betul, Chhindwara, and Seoni (Central Provinces), and Native State of Bhopal (C. I. Agency), 1899; 87 n.w., parts of districts Kheri, Bahraich, Sitapur, Bara Banki, and Gonda (Oudh), 1898; 125 s.e., parts of districts Sylhet, Cachar, and North Lushai Hills (Assam), 1898; 126 s.e., parts of districts Noakhali Chittagong and Native State of Hill Tippera (Bengal), and North and South Lushai Hills (Assam), 1898; 131 n.w., parts of districts Cachar and Naga Hills and Manipur Native State (Assam), 1899.—Central India and Rajputana Survey, 1 inch to a mile. Nos. 205, parts of Native States Oodeypore and Tonk (Rajputana Agency), and of Gwalior and Indore (C. I. Agency), 1891; 410, parts of Bhopal State (C. I. Agency), and of districts Saugor and Narsinghpur (Central Provinces). Seasons 1862-63 and 1871-72, 1899; 471, parts of districts Bilaspur and Mandla (Central Provinces), and Native State of Rewah (C. I. Agency). Season 1871-72, 1899.—North-West Provinces and Oudh Survey, 1 inch to a mile. No. 15, districts Saharanpur and Muzaffarnagar. Seasons 1878-80, 1898.—Punjab Survey, 1 inch to a mile. No. 82, part of district Kohat (Punjab). Season 1882-83, 1899.—Sind Survey, 1 inch to a mile. Nos. 34, 35, district Karachi. Seasons 1894-96, 1899. 48, districts Hyderabad and Karachi. Seasons 1893-94 and 1897-98, 1899. 49, district Hyderabad. Seasons 1894-95 and 1897-98, 1899. 69, 88, 89, districts Hyderabad and Thar and Parkar. Season 1897-98, 1899. 106, 107, district Thar and Parkar. Season 1897-98, 1899.—Upper Burma Survey, 1 inch to a mile. Nos. 305, part of Northern Shan States. Season 1896-97, 1899. 307, parts of districts Mandalay, Kyaukse, and Northern Shan States. Seasons 1895-97, 1899. 351, part of Northern Shan States. Season 1896-97, 1899. 358, part of Southern Shan States. Season 1894-95, 1898. 360, Southern Shan States. Season 1895-96, 1899. 361, the Myelat and Southern Shan States. Season 1895-96, 1899. 398, parts of Northern Shan States. Season 1897-98, 1899. 458, parts of Southern Shan States. Season 1897-98, 1899.—Map of the North-West Provinces and Oudh, 32 miles to an inch, 1899.—District Barrang, 4 miles to an inch, 1899.—District Tippera, 8 miles to an inch, 1899.—District Chhindwara (Central Provinces), 8 miles to an inch, 1899.—District Nimar (Central Provinces), 8 miles to an inch, 1899.—India, to illustrate the gauges of the railways, 1899, 80 miles to an inch.—India, 96 miles to an inch, 1898.—India, 128 miles to an inch, 1898.—Bengal, index map showing scales of publication,

1899. Bengal, index map showing scales of survey, 1899.—North-West Provinces and Oudh, index map showing scales of survey, 1899.—North-West Provinces and Oudh, index map showing scales of publication, 1899.—Conventional signs and terms used in Military Topography. *Presented by H.M. Secretary of State for India, through India Office.*

Palestine, etc.

Grundy.

Murray's Handy Classical Maps. Palestine, etc. Edited by G. B. Grundy, M.A. of Brasenose College, Oxford. London: John Murray. Price 1s. *Presented by the Publisher.*

The following maps are given upon this sheet: Palestine, illustrating Old and New Testament History, according to the Palestine Exploration Surveys, with an inset showing Jerusalem and surrounding district; the countries mentioned in the Old Testament, with an inset on a smaller scale, giving Babylonia, Assyria, Media, and Susiana; the countries mentioned in the New Testament, illustrating the journeys of St. Paul. They are all orographically coloured, and accompanied by an index to the names of places given on the maps.

Siberia.

Toll.

Geologische Skizze der Neusibirischen Inseln und Teilen der Flüsse Jana, Lena, Oleneok und Anabar. Von Baron E. Toll, 1899. Petermanns Geographische Mittheilungen Jahrgang 1900. Tafel 13. Gotha: Justus Perthes, 1900. *Presented by the Publisher.*

NORTH AMERICA.

Central America.

Sapper.

Vulkan-Skizzen aus Guatemala und Salvador aufgenommen von Dr. Carl Sapper. 1898. Petermanns Geographische Mittheilungen Jahrgang 1900. Tafel 12. Gotha: Justus Perthes, 1900. *Presented by the Publisher.*

INDIAN OCEAN.

Indian Ocean.

Royal Netherlands Meteorological Institute.

Waarnemingen in den Indischen Ocean over de Maanden Juni, Juli en Augustus. Koninklijk Nederlandsch Meteorologisch Instituut. Lithografie van Tredding and Co., Amsterdam. 22 sheets. Price 5 g. 50 c. *Presented by the Royal Netherlands Meteorological Institute.*

This is the third part of a meteorological and physical atlas of the Indian Ocean, which is being published by the Royal Netherlands Meteorological Institute, under the superintendence of Dr. J. P. van der Stok. It has been compiled from a vast number of observations, and illustrates the surface temperature of the water, currents, barometric pressure, temperature of the air, rainfall, storms, etc. of the Indian Ocean for the months of June, July, and August. There are in this part altogether twenty-two charts, which, as they represent a good deal of original work, and have evidently been carefully compiled, should be of considerable interest to the student of physical geography as well as of practical value to the navigator.

GENERAL.

World.

Johnston.

The Royal Atlas of Modern Geography. W and A K Johnston, Edinburgh and London, 1898. Fifty-six maps and index. Price 25s. *Presented by the Publishers.*

This edition of Johnston's well known "Royal Atlas" does not contain any maps that have not previously appeared, and nothing more seems to have been attempted than to bring the work up to date. In some respects, however, further revision is necessary, as in the map of Central Asia upon which the Transcaspian railway is only shown as proposed as far as Khokand, and the branch line to the north from Merv is not indicated, whilst in the maps of North America and Western Canada it is evident that full advantage has not been taken of the most recent surveys, especially in the Rocky Mountain region. There are other points that need attention in bringing the atlas up to date, and it seems unnecessary the covering a fourth and one altogether what might be expected in a work of this class. But, however, these matters will be set right in successive editions. It would also be an advantage if the publishers could see their way to add a few general reference maps.

CHARTS.

Admiralty Charts.

Hydrographic Department, Admiralty.

Charts and Plans published by the Hydrographic Department, Admiralty, May and June, 1900. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
536 m	= 1·0	England, south coast:—Royal Sovereign shoals to Dungeness. 1s. 6d.
3116 m	= 1·1	Scotland, west coast:—Island of Islay. 2s.
1150 m	= 6·9	River Thames:—Erith to Broadness. 2s. 6d.
3118 m	= 1·4	Norway, west coast:—Batalden to Vangsø, including Frøisiøen. 2s. 6d.
1308 m	= 4·0	Greece, east coast:—Head of the gulf of Nauplia. 1s. 6d.
3119 m	= 8·0	Egypt, north coast:—Alexandria harbour. 2s. 6d.
1142 m	= {3·2 9·9}	Brazil:—Port of Cape Frio, north cove. 1s. 6d.
556 m	= {1·0 3·9 5·8}	Plans in Magellan strait:—Coast between Glascott point and Cape San Isidro, Fortescue and Cordes bays, etc., Carreras bay, Sung bay, Notch cove (reproduction). 1s. 6d.
3136 m	= 2·9	Anchorage in Alaska:—Karluk anchorage, Larsens bay, Uyak anchorage. 1s. 6d.
2402 m	= 0·65	China sea:—Straits of Durian, Sugi, and Chombol. 1s. 6d.
1153 m	= 0·58	Celebes, north coast:—Pulo Motuo to Tanjong Lutuno. 1s. 6d.
2880 m	= {2·7 2·9 4·0}	Japan, bays on the north and west coasts of Kiusiu:—Tomioka bay, Kuchinotsu bay, Tobo Byochi. 1s. 6d.
3114 m	= 9·8	Japan, anchorages in Simonoseki strait:—Mojiko. 1s. 6d.
131 m	= 5·8	Japan:—Kurusima no Seto. 1s. 6d.
3131 m	= {2·9 5·9}	Anchorage in New Hebrides islands:—Hog harbour, Lonock bay. 1s. 6d.
3036		Balearic islands:—Plan added, Harbour and anchorage of Palma.
577		British Columbia:—Plan added, Telegraph cove.
3029		British Columbia:—Plan added, Portier pass.
1456		Africa, west coast, River Cameroon:—New plan, Ambas islands.
911		Anchorage between Borneo and New Guinea:—Plan added, Bula bay.
2193		Anchorage between Mindanao and Celebes:—Plan added, Kawio anchorage.
2718		Anchorage on the east coast of Celebes:—Plan added, Pajonge anchorage.
1519		Plans in the Si Kiang or West river:—Plan added, Sheung Lung rock.
2355		Anchorage in the Solomon islands:—Plan added, Pavuvu islands.

(J. D. Potter, Agent.)

Charts Cancelled.

No.	Cancelled by	No.
1187 Plan of Palma harbour on this chart.	New plan.	
1518 Plan of Nauplia on this chart.	Harbour and anchorage of Palma	3036
530 Plan of port of Cape Frio on this chart.	New plan.	
556 Anchorages in Famine and Forward reaches.	Head of the gulf of Nauplia	1308
900 Notch cove.	New Plan.	
2402 Straits of Durian, Sugi, and Jombol.	Port of Cape Frio	1142
131 Kurusima no Seto.	New sheet.	
	Plans in Magellan strait	556
	New chart.	
	Straits of Durian, Sugi, and Jombol	2402
	New plan.	
	Kurusima no Seto	131

Charts that have received Important Corrections.

No. 2587, Ireland:—Coastguard stations. 2050, England, south coast:—Approaches to Spithead. 394, England, south coast:—Spithead. 2793, England, south coast:—Cowes harbour. 2500, Scotland, west coast:—Bu Ruag to Gruinard bay. 2500.

Scotland, west coast:—Lochs Broom. 1887, Germany, west coast:—Eider river to Blaavand point. 2115, Denmark:—The Sound. 790, Denmark:—Approaches to Copenhagen. 175, Sicily:—Milazzo bay. 285, Newfoundland:—Orange bay to Gander bay. 2470, United States, east coast:—New Bedford harbour. 479, Anchorages in Puerto Rico. 2037, Trinidad:—Bocas de Dragos, port of Spain. 1493, Central America:—Port Chagres. 868, Ports and anchorages on the west coast of Central America. 2839, United States, west coast:—Columbia river. 2840, British Columbia:—Haro strait and Middle channel. 1500, Alaska:—Kadiak island to Segum island. 1421, Africa, east coast:—River Oninde. 2636, Strait of Makassar, north part. 2577, Philippine islands, between St. Bernardino and Mindori straits. 2454, Philippine islands:—Northern portion of Luzon. 2562, China, south coast:—Canton river. 857, China, Kyan chau bay. 1258, Korea:—Approaches to Séoul. 913, Korea, west coast:—Mackau group to Clifford islands. 836, Japan:—Amakusa islands and Yatsushiro sea. 205, Japan:—Nanao harbours. 1750, South Australia:—Port Adelaide. 2726, New Zealand:—Manukau harbour. 2421, Tonga or Friendly islands.

(J. D. Potter, Agent.)

United States Charts.

U.S. Hydrographic Office.

Pilot Charts of the North Atlantic Ocean for July and August, 1900, and North Pacific Ocean for August and September, 1900. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

China.

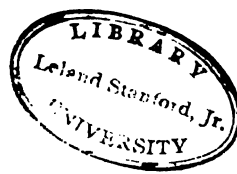
Jack.

Forty-eight Photographs of the Yangtse Valley and Sechuen, by R. Lockhart Jack, Esq., 1900. *Presented by Dr. R. Logan Jack.*

In view of the present general interest in China, these photographs, which were taken in the early part of the present year, are specially interesting. They are about 5 inches by 4 inches in size, and many of them are remarkably clear. The following is a list of their titles:—

(1) Wu-hu; (2, 3) Pagoda at N'gan Kin; (4) Orphan rock, with monastery and pagoda, below Kiukiang; (5) Steamer Shazi (Butterfield and Swire), Hankan; (6) Timber raft above Hankau; (7) East end of Hoang-ling gorge; (8) Geological Party's houseboat in the Middle Rapid, Chin-tan (Hupei); (9) Dr. R. L. Jack; (10) J. F. Morris; (11) R. Lockhart Jack; (12, 13) Junk going down Yangtse; (14) Contortions in sandstones and shales, Tai-tse-wan; (15) Gate of temple (interior) at Wu-shan; (16) Buddhist monks, Wu-shan; (17, 18) Salt well in dry bed of Yangtse at Kwei-fu, Szechuen; (19) Salt waiting to be taxed at Likin station, Kwei-fu; (20) Looking up the Sin-tan (New Rapid), Sechuen; (21) Junk being tracked up the Sin-tan (New Rapid); (22) Trackers hauling up junk at Sin-tan; (23) Pagoda at Wan-hien, Sechuen; (24) Bridge at Wan-hien; (25) Buddhist temple at Shi-pao Shih, Sechuen; (26) Pagoda giving access to Buddhist temple at Shi-pao Shih; (27) Top of pagoda from entrance to temple at Shi-pao Shih; (28) Looking down the Sin-tan (New Rapid); (29) Bridge at Ning-shih, Sechuen; (30) Roadway of bridge at Ning-shih; (31) Life boat ("Red Boat") which followed the Geological Party from Ichang to Chung-king; (32, 33) Arch over roadway of bridge at Ning-shih; (34) Hospital at Lo-tsi-se, near Chung-king; (35) Bridge, 3 miles east of Ning-shih; (36) Sampans supporting tracking lines over a shallow rapid; (37) Bow-pilot of Geological Party's houseboat; (38) Buddhist temple, Lung An; (39) Idol in the temple, Lung An; (40) Cantilever bridge on the Fu Kiang; (41) A Mantsu village; (42) Garden of Magistrates, Yamenat Wen Chuan; (43) Idol (Goddess of Mercy) in the temple at Lung An; (44) Roofed bridge, gorge of the Fu Kiang; (45) Sifan tribesmen; (46) Ching Ping Kwan; (47) Cha Erh Ngai, a typical flat-roofed Sifan village; (48) Temple of Li Ping, the engineer who designed the irrigation system for the Cheng-tu Plain, Kwan Hsien.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.





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JOURNEYS IN CENTRAL ASIA.*

By Captain H. H. P. DEASY.

HOPING that both Dalbir Rai and myself would improve in health from marching daily, we left Yarkand on February 8, and went back along the old route as far as Chumdi. Thence the course of the Yarkand river was followed for a short march as far as Taklay, the Chiung Sai valley being next ascended, and the Arpatalak pass crossed *en route* to Langar, which I ascertained to be about 10' further north than was supposed to be the case. The Yarkand river was frozen over close to this very small village, so we crossed to the opposite bank with ease, and continued the journey as far as the foot of the Khandar pass. The heavy snow which fell during the day and night in which we were camped close to it, effectually blocked the track, necessitating a return to Langar, where the ice had then almost disappeared from the river. Not being able to place much reliance on what the natives told me about routes, I decided to go back to Taklay and thence travel to Kosarab, with the intention of seeing if it was feasible to ascend the valley of the Yarkand river from that point. The absence of ice, the winding nature of the river, and the very precipitous barren mountains through which it flowed, proved to be insurmountable obstacles. Both Dalbir Rai and I were now much worse than when we left Yarkand; neither of us was able to do any surveying, which made it advisable to return direct to that town, which was reached on March 1. During the greater part of my stay in Yarkand this time, I was very fortunate in having the company

* Map, p. 596. Continued from p. 164.

of Mr. M. Backl nd, a Swedish missionary, and of Mr. Macartney, whom duty brought there. Thanks to the valuable help of the latter, who assured the ignorant Tektai, or commanding officer at Yarkand, that I had no intention of dropping shells into the Yang-i-Shahr, I was at length afforded permission to take observations on the site where Trotter observed, in order to ascertain the difference of longitude between his station and mine outside the town. Being unprovided with a flying-machine, it was now absolutely impossible to travel through the unexplored parts of the valley of the Yarkand river, so I determined to spend the summer in the northern part of Tibet, and once more endeavour to penetrate through the unknown part of Chinese Turkestan in winter.

Macartney having met with a man who professed to be intimately acquainted with many half-buried cities in the far-famed Takla Makan desert, I deemed it worth while engaging him as guide on the condition of "no cities no pay, many cities much pay," and on the chance that he would guide me to one or two places of interest. On April 12, when some iron tanks, in which honey had been brought from Russia, had been made as water-tight as was possible by local skill, and suitable frames constructed to support them when full of that much-prized, indispensable liquid, water, I set out from Yarkand for Guma, where I had to wait until the camels arrived from near Kharghalik. As soon as these all-important beasts of burden arrived, a start was made for the Takla Makan, our route passing through the oasis of Kara Targaz, where we filled up the water-tanks. Placing more reliance on an old man whom the so-called guide, Islam Akun, produced at Guma, and not wishing to take with me any more men than were absolutely necessary, I sent the guide back after the first march in the desert. The most striking features of this part of the Takla Makan are the large amount of brushwood known as jilgan, numerous half-dead trees, the well-defined ditches round the sand-dunes, many of which must be nearly 20 feet high and somewhat more in diameter, and the absence of any regular slopes in the sand. Judging from these noteworthy facts and the amount of vegetation, it is evident that at no very remote epoch the rainfall must have been considerably heavier than at present. Early in the morning of the third day after leaving the oasis of Kara Targaz it was very plain that neither of the so-called guides knew their way, and when, on being pressed for information as to the distance to the nearest deserted city, called Ak Tala Tuz, which I believe to exist only in the imaginative brain of Islam Akun, they pointed to a few trunks of trees as being the ruins of a house, I settled to return. Shortly after this was decided upon, the guides announced to Raju, my caravan bashi, that it was most fortunate the sahib had returned, as they had never before been so far into the desert, and if we had gone on any further they would not have been able to find their way back. During the return march I several times tried to guide myself, but the great sameness of the scene rendered it

impossible, so we followed our own tracks. The guides were now very much alarmed for their own safety, and acknowledged that they knew nothing about Ak Tala Tuz until Islam Akun made them promise to assert to me their intimate knowledge of the entire Takla Makan, and of these ruins in particular. At times the ways of natives are very strange, but it was left to Islam Akun to make me wonder for a long time as to what he hoped to gain by professing to be able to guide me to deserted cities, when he had not the slightest idea of the whereabouts of any; especially when his pay depended upon the fulfilment of his promise. The men who professed to be able to guide me to Ak Tala Tuz were punished by me, and Islam Akun was rewarded for his share in the transaction by the Amban of Khotan, who decorated him for one month with a large and heavy square board round his neck.

After checking the longitude of Khotan, I went to Polu *via* Chaka, intending to go direct to the Aksai Chin and Northern Tibet as soon as the sheep and supplies had arrived from Ladak, but I reckoned without my hosts, the Chinese. At Chaka a halt of some duration was made, in hopes of getting a good view of the Tekelik Tagh range, in which there are two peaks fixed by the Survey of India. Unfortunately the hazy season had set in, and this scheme had to be abandoned. After some delay at Polu, it was very plain that I should not get any help from the Polu people for a journey into the mountains, owing to the orders of the Chinese; and as the sheep and supplies had not arrived from Ladak, I went to Kiria to interview the chief obstructionist, as it was impossible to go without hired transport. Although this ignorant and unreasonable official had inspected my Tsung-li-Yamen passport, and knew full well that it was my intention to visit that part of his district lying beyond the Kwen Lun range, and that I intended to return to Polu, he proved obstinate, and obliged me to make a lengthy *détour* to Kara Sai. From this wretched spot, where a few shepherds and goatherds live in places hollowed out of the loess, the ascent to the Tibetan plateau is very gradual, being for the greater part up the valley in which the Tolan Khoja river has its source. From Kara Sai and its vicinity, the little transport that was required to supplement my own was procured after a short delay.

In the lower part of the Tolan Khoja valley there is plenty of excellent grass and water, but in the upper part, known as Sarok Tuz (yellow salt), there is no grass, but only a limited supply of burtza and not much water. At the head of this valley lies a pass of about 16,500 feet, a very easy and comparatively low one, which may be considered the natural boundary between Turkestan and the great Tibetan plateau. Looking forward from a hill near this pass, not a trace of vegetation is to be seen, and it was not till the western side of the small and irregularly shaped lake called Shor Kul was reached that any grass was obtained. Although it was now midsummer, and the glaciers and snow-covered

mountains of the Kwen Lun range, which form the northern boundary of the depression containing this salt lake, face the south, only one tiny rivulet was noticed coming from them. Between the lake and the Kwen Lun range the country is absolutely barren. At the first camp beyond Shor Kul there was little or no vegetation, so the remaining sacks of chopped straw were issued. Here it was again necessary to dig for water, which was by no means sufficient for all the animals. However, they quenched their thirst the next day, after a few hours' march, when the most easterly tributary of the Kiria river was reached. This tributary and the next are undoubtedly the smallest of the five principal affluents of the Kiria river, and flow through country devoid of all vegetation. The two Kara Sai guides having agreed to accompany us only as far as Yepal Ungur, on the Kiria river, where there is some excellent grass, it became our turn to lead the way. Finding fairly fresh tracks of men and donkeys around two recently killed yaks, I directed Raju to follow them up, and if possible to find his way to Polu and bring back the sheep and supplies which had arrived there after my departure. Although this man knew perfectly well the general direction of Polu, he at one time went in exactly the opposite direction until he came to the sources of the Khotan river, where he found two men hunting yak. Much to my surprise, I came across a fair-sized river west of Yepal Ungur, which was not shown on any map, so I decided to follow it down as far as possible and survey its course. This scheme had soon to be abandoned, owing to the exceedingly narrow rocky valley in which a waterfall soon proved too formidable an obstacle; we had already passed one after spending some time building up a narrow track.

Continuing our journey west over a high pass, the fifth and most westerly tributary of the Kiria river was met, and camp pitched at a place called Aksu, where I had to halt for some days on account of bad weather. My plan was to establish a trigonometric value for the longitude of Aksu by means of some peaks fixed by the great Trigonometrical Survey of India, but the very extensive sea of snow mountains lying south and west of the depression in which lie Ulugh Kul and Achak Kul interfered effectually. Efforts to economize time by sending out reconnoitring parties in an easterly direction from Yepal Ungur proved of no avail, as one party speedily returned with the excuse that nobody had ever been before them, another went north-east instead of south-east or south, while the third party assured me that a feasible route had been discovered in the desired direction, a statement which proved untrue. Ever since leaving Kara Sai the weather had been very severe, and heavy rain and numerous snowstorms so interfered with accurate surveying, that I decided to carry the triangulation from Aksu back to near Shor Kul, obtain good values for the co-ordinates of all the principal mountains, and finally establish trigonometrical and topographical connection with the survey executed in 1896. In this I was

successful, as also in ascertaining that there is no feasible route between Kara Sai and Polu leading in the direction of Central Tibet. I believe it has been often stated that in bygone times the Tibetans from the direction of Lhasa used to regularly visit Polu. I cannot find the slightest corroboration for this, unless perhaps the ruined post, or petty fort, at Baba Hatum may be considered proof that the Tibetans formerly inhabited that comparatively fertile part of the area known as the Aksai Chin. Repeated endeavours were made to ascertain the origin of this designation, but no information on this subject could be obtained either from the Chinese or the natives of Turkestan. In all probability the title Aksai Chin was given to this inhospitable area on account of the



VIEW OF KWEN LUN RANGE, FROM SHOR KUL.

innumerable snow mountains in it and the generally barren nature of the country. On arrival at "Fever camp," or camp 15 of 1896, there was no water where it had been previously obtained, but fortunately some was reached by digging in a small ravine close by. From the hills near this camp observations were taken of peaks fixed in 1896, after which camp was moved about 10 miles east to admit of sufficiently long bases being obtained. These bases varied in length from about $7\frac{1}{2}$ to 12 miles, and as the most distant peak, a singularly prominent one, 23,490 feet, was under 70 miles from the most distant hill station, the distance from it was accurately measured, as well as that from two other peaks. The inevitable strong wind was a great drawback, and necessitated the use of strong ropes to tie down the theodolite to large rocks. The absence

of more than two good points in the fine snow range on the left bank of the Kiria river near its source made me for a time rather anxious as to the connection between the 1896 and the current triangulation being good. This anxiety was soon, however, removed, as I was able to identify from Baba Hatum and the vicinity some peaks on the long and majestic snow range on the right bank of the Kiria river, which had been previously observed from near Yeshil Kul. The weather being exceedingly fine on my return to Aksu, another halt was made there for the purpose of observing some prominent peaks which had been previously too much obscured by clouds to admit of accurate observation.

Raju, having now returned from Polu with the sheep and supplies, guided me to the sources of the Khotan river—not the Kiria river, as some of my critics who have never been anywhere near the place thought fit to assume. There I was able to take good observations for latitude and longitude, and as it is only one short march from Aksu, the position of which was very carefully determined by triangulation, I venture to assert that the longitude of camp 113 on the right bank of the most northerly source of the Khotan river has been accurately determined by me. Colonel Trotter apparently considers that the Khotan river rises close to the pass shown on my map as being in lat. $35^{\circ} 11'$, long. $81^{\circ} 37'$, and that it flows west for some distance before turning north. One of the chief objections to this theory is the fact that the river which rises close to that pass on the south side of it was actually seen by the sub-surveyor, Leno, to flow into a large lake at about the intersection of the 35th parallel with the 81st meridian. Another objection, and I think a weighty one, to Colonel Trotter's theory, is the existence of an extensive snow range which lies between the real and the imaginary sources of the Khotan river. From the numerous glaciers and springs on the south side of this range, the northern branches of the Kiria river have their origin. With a view to making certain of carrying the triangulation across the Kwen Lun range, and thus getting an accurate value for the longitude of Polu, as the base of future work, it was considered advisable to spend a day close to the At To pass, whence the very steep descent into the Polu gorge begins. In this dismal locality there is not the slightest sign of any vegetation, the absence of which rendered it necessary to get from Polu chopped straw, barley, and firewood. As a proof of the great willingness of the people of this village to assist a British traveller, it may be mentioned that, although they had been repeatedly ordered not to assist me, when returning to their village they brought the all-important supplies to the At To pass, and subsequently gave me a large present of most delicious and welcome peaches, melons, and grapes. There being little or no baggage by this time, the descent through the very difficult Polu gorge was accomplished without mishap, and Polu re-visited on September 25. The harmony of the few days' rest at Polu was disturbed by Dalbir Rai,

the sub-surveyor, who suddenly rushed into a small room, drew his kookery, loaded his carbine, and threatened to shoot me or any one else who might venture to approach him; but thanks to my orderly, Abdul Karim, who displayed great tact and presence of mind on this occasion, Dalbir Rai was induced to lay down his carbine.

After nearly a fortnight's rest at Yarkand, I set out on November 3 with all the best-conditioned animals, determined to make a fourth attempt to explore the unknown parts of the Yarkand river.

For some time I was in great doubt as to the best route to take, but finally decided to go *viâ* Takla, the Arpatalak Dawan, Langar, and the Khandar Dawan, to the upper part of the valley known to most Sarikolis as Uchi, but to some as Wacha. In the previous winter, a heavy fall of snow on the night I reached the foot of the Khandar Dawan prevented me crossing it. To my great surprise, there was no ice on the Yarkand river at Langar when I crossed it on November 9, the transit being effected on camels kindly supplied by the Beg of Sarikol, while the ponies and donkeys had to swim. The most alarming reports as to dangers attending the approach to the Khandar Dawan from the east side turned out to be greatly exaggerated, but the latter part of the ascent is undoubtedly very steep and stony, while for a short distance close to the summit the ponies with half-loads and the donkeys without any had to be assisted by men, as the so-called road had been rendered exceedingly slippery by a recent slight fall of snow.

Pending the arrival of the sub-surveyor (very kindly sent by the Survey of India to relieve the man who had been previously lent to me), camp was pitched at Gombaz, at a height of about 12,230 feet, at the foot of the Khandar Dawan, on the west side, as the valley is there much broader than at Khurak, and far more suitable for measuring long bases.

At Gombaz, a short base was carefully measured by means of a 10-foot subtense bar, and subsequently three other bases, forming an almost equilateral triangle whose sides were about 6 miles. By placing the most westerly hill station opposite to Gombaz, on the west side of the Uchi valley, I hoped to be able to again observe some of the peaks previously observed from the west end of Raskam, but an irregular range of considerable height intervened and compelled me to go so far from the station near Gombaz, whence the Raskam peaks had been observed, that it was impossible to distinguish the pillar, about 6 feet high, erected at the latter station, from the background of mountains of a similar colour.

Though a start was made from Gombaz about 8 a.m. for the west side of Uchi, it was not till about 3.30 p.m. that a site, probably well over 15,000 feet, commanding views of the peaks observed from the west end of Raskam and from near Gombaz, was reached, after considerable labour. This was, unfortunately, a day wasted, as the other end of the

base could not be observed; so there was nothing to do but pack up the theodolite, load the yak, and make tracks for camp, which was not reached by me till after 8 p.m., and by the men with yaks till much later. Having obtained fresh yaks, I returned the next day to the west side of Uchi, erected the theodolite at a much lower elevation than before, and observed Muz Tagh Ata—which has, according to the Pamir Commission Report, been carefully fixed by the survey officers of that Commission—and other peaks which I had previously observed from the Taghdumbash Pamir in 1897, thus getting a good trigonometric value for the longitude of Gombaz, the starting-point of my work on this journey. Just as the necessary observations had been almost finished, the new sub-surveyor arrived from Yarkand, and, after a day's rest, began topographical work on the scale of 8 miles to 1 inch.

During my stay in Uchi, I repeatedly but unsuccessfully endeavoured to obtain information about the unexplored parts of Sarikol and the valley of the Yarkand river. A certain amount of news of the route followed by Grombchefsky from Uchi to Sanglash was forthcoming, as also about Mariong; but beyond that the Tajiks professed absolute ignorance. The only thing to be done was to go to the valley erroneously called Mariom Pamir by one route, and leave it by some other.

The ascent to the Thung, or Thungal pass, about 14,000 feet, which intervenes between Uchi and the Mariong valley, up a narrow valley with water for most of the way and plenty of grass at its head, is quite easy, but the descent is for some hundreds of feet very steep, but good and quite feasible for laden animals. On November 29, this pass was almost quite free from snow. The Ming Bashi of Mariong being ill, he sent his son and a few other men to Mariong, a small village of about eight houses, a few miles from the Thung pass, to meet me and nominally to render assistance. Inquiries as to the Mariong valley and the routes leading to Raskam were speedily instituted, but it was soon very evident that no information of any value was to be obtained from the Ming Bashi's son, or from any one else. All denied the existence of any route to the south, and even as to the probable distance of Nosh Tung, which was stated to be at the junction of the Mariong and Yarkand rivers, it was impossible to discern truth from falsehoods. The Ming Bashi's son at first stated that Nosh Tung was two days' journey from Mariong, then three, then one, then two; but all agreed that it was situated at the mouth of the Mariong river.

According to most maps there is a Mariom Pamir, but such is not the case, as the valley, whose real name is Mariong, is very narrow, with exceedingly precipitous barren mountains rising to 2000 feet on either side. Cultivation is carried on wherever it is possible, but "Pamir" is a misnomer, as extensive grazing-grounds and a broad valley do not exist. The general direction of the Mariong valley is

about east and west, the latitude of Mariong being $37^{\circ} 23' N.$, and that of the mouth of the valley $37^{\circ} 19' N.$

Owing to the numerous lies told by the Ming Bashi's son and by others, I left Mariong in ignorance of where my next halting-place would be. On reaching a fairly large village with numerous fruit trees and a little cultivated land round it, I was told that it was Nosh Tung, but as it had been invariably stated that this was at the mouth of the Mariong valley, I pushed on until out of sight of the village, when I halted to await the arrival of the caravan. As it was nearly four o'clock before the caravan came in sight, and as nothing certain was known about the track onwards, it was decided to halt at Nosh Tung and try to obtain



GLACIERS NEAR SOURCES OF KIRIA RIVER.

some information about the feasibility of going up the valley of the Yarkand river, or by some other route, to the west end of Raskam. Evidently there was a great desire to get me out of the country as soon as possible, and to withhold even the scantiest information about routes leading in the desired direction; so I set out the next day to take observations at the mouth of the Mariong valley, while the sub-surveyor climbed to a peak above the Sargon pass, about 3500 feet above Nosh Tung, whence he was able to see the points fixed from near Gombaz, and a large expanse of country as well.

While my time was occupied in taking solar observations for latitude and longitude at the mouth of the Mariong valley, one of my men was sent to follow up the track along the left bank of the Yarkand river,

and see if it was possible to take laden animals along it for any distance. His report being very fairly satisfactory (the Nosh Tung people had denied the existence of any track), I determined to take a few ponies with me and go as far south as possible. The Ming Bashi sent a couple of camels with me, on the chance of their being required to ford the Yarkand river, but he took good care to send with them two worthless fellows, one a partial idiot, and the other a comparative stranger to Mariong.

About a couple of miles below Nosh Tung there are several hot springs, the temperature of the warmest being more than 130° Fahr. A little further down, the valley becomes exceedingly narrow and the track proportionately bad, while the necessity of repeatedly fording the Mariong river was by no means appreciated by the camels.

In order to avoid twice fording the Yarkand river, an exceedingly steep sand-slope had to be crossed, the descent from which was so steep that all the loads had to be taken down by the men. After a few miles one of the camel-men, who had hitherto professed complete ignorance of this part of the country, said that if we went beyond the first side valley, in which there was a semi-frozen stream and a little grass, nothing would be found for the animals further on; so a halt was made, and, after an hour's work, sufficient space was cleared for two small tents. This valley, only about 30 yards broad at its mouth, is so choked up with jungle, and the ice is so slippery, that the laden animals had great difficulty in penetrating up it a few score yards, and even when freed from their loads, progress to where there was tall dry kamish grass, at that season devoid of much nutriment, was by no means easy. Continuing along the left bank of the Yarkand river, it soon became necessary for the men to carry the baggage for 200 yards over sloping and slippery rocks, as the ice was not thick enough to bear even a man's weight. The valley, some miles ahead, was so narrow that I went forward to reconnoitre, but further progress soon became impossible. Utterly barren mountains rose sheer up on both sides to an estimated height of 3000 to 5000 feet, the river was too deep to ford, and the ice too thin to support a man. Plenty of good dry wood was obtained, but, unfortunately, nothing for the animals, which had to subsist on a couple of handfuls of grain.

While the caravan returned the following day to Nosh Tung, the sub-surveyor tried to climb to a peak from which he hoped to get extensive views, but, after reaching an altitude of about 5000 feet above the valley, the steepness of the mountain-side prevented his going up any higher. Owing to the very short time that the sun was visible from the mouth of the Mariong river, the observations for longitude were not as satisfactory as could be desired; and as that is the most westerly part of the Yarkand river, I checked them by observations of east and west stars, Polaris and a south star being observed for latitude.

The absence of sufficiently strong ice on the Yarkand river, and of sufficient camels for fording the river, compelled me to follow the route originally pointed out by the Nosh Tung people, viz. *via* Pichanyart to Pil. Accounts as to the number of passes and marches between Nosh Tung and Pil varied considerably. The passes being reported to be very bad, several yaks were hired, so as to lighten the ponies' loads—a precaution which proved to be very necessary. The Sargon pass, about 11,500 feet, was the first crossed, after many hours' hard work for men and animals. The track leading up to this pass from Mariong is exceedingly narrow, and in places the gradient is so severe that men and animals have to rest every score or so yards. The latter part of the descent is fully as bad, and a careful look-out for stones knocked over the mountain-side by the rear of the caravan had to be kept by those in front. The velocity attained by these small stones was often so great that it was necessary for those in front to halt under shelter of some friendly boulder or cliff, until the men and animals behind had passed the point directly above them on the winding track. Occasionally a yak would leave the very steep zigzag path and rush off to one side, sending countless stones down the mountain slope. The much-cursed brute would then stand there—how he managed to maintain his equilibrium was a wonder—until some extra large stone thrown by one of the many volunteers for the work induced him to move on. When the Yarkand river is frozen, this pass could be avoided; but I doubt if anything would be gained thereby, as additional stretches of the very narrow Mariong and Pichanyart valleys would have to be traversed.

At Pichanyart, where there are a couple of houses and a small patch of cultivated ground, Grombchevsky's route was entered on. Turning up the first side valley below Pichanyart, the route lay along the bottom, in which there is a fairly thick jungle and a small stream. This was so much frozen that crossing it repeatedly was difficult for the animals, which had to be preceded by an advanced guard to roughen the ice and spread earth over it. After crossing the Sharnoz pass, about 13,500 feet, a fairly easy one, the inevitable descent of several thousand feet had to be made into a valley of the same description as that on the other side, and a halt for the night made at Sharnoz, where there are a couple of deserted houses and a few square yards of land which had formerly been cultivated. To my intense disgust, it was necessary to camp the next day only a few miles distant from Sharnoz, as the men with the yaks stated that neither fuel nor water would be found further on, until two passes were crossed and the other side of the Yarkand river reached. After a careful search at this camp (Shamatagl), it appeared probable that in the summer-time perhaps a little good grass grew there, but at the time there were only tufts of very coarse grass, which the ponies, hungry as they were, would not touch.

Owing to the height of the very steep mountains above Shamatagl, it was necessary to ascend 200 feet, and then level a space just large enough to take observations without much risk of the theodolite being overturned. The ascent from Shamatagl to the pass, about 13,000 feet, which bears the same name, is very steep, but the track was almost free from snow, and the going comparatively good. From a peak but slightly higher than this pass, a most extensive view was obtained, thus enabling the sub-surveyor to get a good fixing and execute much useful work.

The descent from the Shamatagl pass, on both sides of which there is plenty of grass, being very easy, I hoped that the remainder of the march down to the Yarkand river would prove to be of a similar nature, but this was unfortunately not the case. Having descended about 2000 feet, it was necessary to make a very gradual ascent of about 150 feet, when the Tugadir pass was reached, and the valley of the Yarkand river was seen several thousand feet below. From the top of this pass only a few yards of the track was visible, the remainder being so precipitous that I paused for some time to wonder how even unladen ponies could, with any degree of safety, reach the valley below. Fortunately, the ponies were very lightly laden, yaks carrying the bulk of the baggage, and by ceaseless care and attention on the part of the caravan-men, who repeatedly had to hang on to the ponies' tails to prevent them from turning somersaults, no serious casualties happened.

Soon after reaching the Yarkand river, we received, with great joy, the news that the river was now well frozen over in a few places, and also along the bank, where the track is so bad that even unladen yaks cannot pass along without several men to assist them. No mention was, however, made of the short but exceedingly dangerous corner close to Sanglash which had to be passed. As it was not necessary to unload all the ponies, I suppose this spot is considered quite good by the usual frequenters of the Pil valley. Most of the ponies, having had so much experience of bad tracks which many goats would go along with caution, passed this vile spot without mishap, and the caravan reached about dusk the miserable village of Sanglash, at the mouth of the Pil valley, and about three-quarters of a mile from the Yarkand river. Sufficient chopped straw and barley being obtainable, a much-needed rest of one day was taken, and messengers were sent for fresh yaks to transport the little baggage there was to the west end of Raskam.

As I distrusted the information supplied by Tajiks, I sent on one of my own men to see if it was feasible to descend the Yarkand river, and he speedily returned, reporting the route to be still impracticable owing to absence of sufficient ice.

Fresh yaks having been procured, the Pil valley was ascended without much difficulty up to Chadder Tash, two short marches from Sanglash, where plenty of grass was reported to be. As usual the information

was false; a little burtza closely cropped by sheep, and of no use for ponies or donkeys, was the only vegetation to be found.

A little snow having fallen during the night at Chadder Tash, rendered the next day's march additionally troublesome, and one donkey, owing to snow and clay having balled in his feet, slipped and fell 200 feet on to the rocky bed of the narrow valley. The annoying circumstance attending this accident, the only serious one which happened during the whole journey, was the comparative excellence of the track where the donkey slipped, the breadth being about 8 inches. Curious to relate, although the donkey was killed almost instantaneously, no damage worth speaking of befel his load.



GENERAL VIEW OF SANDS OF KHOTAN RIVER.

Bad as is the descent to the Yarkand river from the Tugadir pass, there is a short descent—drop would be a more appropriate term—a few miles above Chadder pass, which is far worse. After pick-axes had been freely used for some time, and all the large loose stones put out of harm's way, the yaks, aided by several men, were sent on first. No doubt these hardy and exceptionally surefooted beasts had many times previously passed this spot; but even so, it was astonishing how they kept their footing. Most of the ponies, with several men assisting each one, managed to descend most of the way on their feet, but not so the donkeys, which slid and rolled down, often in a very alarming way.

Perhaps a somewhat better idea of the nature of the track between Chadder Tash and Pilipert, distant about 7 miles, may be conveyed by

mentioning that the caravan of eight yaks, twelve ponies, and nine donkeys, with plenty of men to assist, took seven hours to accomplish this march.

From Pilipert all the ponies and donkeys were sent to the Kulan Urgi valley to rest, while efforts to reach the country north of the west end of Raskam, the limit of surveying done in the previous winter, were continued. Yul Bash, the man who professed to be well acquainted with the route, occupying four days, in which as many passes have to be crossed, now asserted that another route, which some Kirghiz had followed on the previous day, was preferable, but that he did not know it. This guide had accompanied me in the previous winter from the Taghdumbash Pamir, through Raskam to Bazar Dara, and, in accordance with the secret orders issued by the Chinese, always asserted that he was quite ignorant of the country into which he was then guiding me. All the men accompanying the yaks, no doubt owing to the plan previously determined upon, professed similar ignorance of both routes, and stated that the best course to adopt would be to follow the fresh tracks of the Kirghiz.

From Pilipert, about 14,400 feet, onwards to the pass at the head of the Pil valley, which we had to cross, the country was covered with snow, so it was quite easy to follow the tracks of the cattle of the Kirghiz. By judiciously questioning the yak-men individually, it became evident that the route was, in fact, well known to at least some of them, but that for some mysterious reason they professed to be unacquainted with this part of their country. One man became quite indignant when he realized that he had been entrapped into displaying knowledge of the route, and vainly protested he only thought such and such to be the case; but the desired information was obtained, and further questioning became needless.

An occasional snowdrift somewhat delayed the ascent, but the most formidable obstacle was a large and very sloping glacier, up which the yaks had much difficulty in proceeding, owing to the comparative smoothness of the ice, which the wind had swept almost quite clear of snow. As soon as this glacier was reached progress became exceedingly slow. The shelter of a friendly side valley had to be abandoned, and, the full force of the biting cold head wind being experienced, the hardship of the march was greatly increased. With a temperature of -8° Fahr. at 2 p.m., and a strong head wind, riding became impossible, and even with three pairs of the thickest woollen socks, I was unable to keep my feet warm when crawling up the glacier. It was not till after 3 p.m. that the top of the Mamakul pass, about 17,000 feet, was reached.

A very brief halt was made for the purpose of boiling a thermometer, a trying operation to perform, as gloves had to be temporarily discarded, when my fingers became so rapidly benumbed from touching the

hypsoneter that I had to pause several times and endeavour to partially restore circulation. The temperature of the steam of boiling water on this pass was $180^{\circ}2$ Fahr., air-temperature -5° Fahr. All thoughts of using the plane-table, even for a brief period, in this most inhospitable spot had to be abandoned; but this was not of much consequence, as the pass was fixed subsequently.

For a few hundred feet the descent from the Mamakul pass is so very steep that two men, who went on ahead to reconnoitre, had the greatest difficulty in descending safely, but those who followed the yaks had a somewhat easier task. As soon as the foot of this shale slope was reached, the heavily laden yaks, by that time fairly tired, were urged forwards as much as possible, in hopes of reaching before dark some fairly sheltered spot, sufficiently free from rocks and boulders to enable us to lie down for the night. In a very short distance, however, the valley became exceedingly narrow and steep, and so filled with boulders and large rocks that the pace of the yaks was little more than that of a snail, and by dusk we were still unpleasantly high and too near to the pass to think of halting.

Having again told the men to urge the yaks forwards as quickly as possible, I went on ahead, hoping to reach a place with ice and fuel before it became too dark to proceed. Much to my surprise, I came suddenly upon a herd of burrhel, which had come down to the stream for water or to lick the ice; but my rifle was behind, so I pushed on till I reached a place where there was a little brushwood and a fair chance of finding a somewhat level spot to sleep on. As it was now too dark to guess where the largest rocks were, and as stumbling over them in the dark is not exactly the height of enjoyment, I settled to halt there; but Yul Bash, the quondam guide, who hitherto professed entire ignorance of the route, now said that there was an ungur, or shelter, formed by overhanging rocks or mountain-side, only a very short distance further on, with more fuel close by, so we stumbled on for a few hundred yards, and reached the so-called shelter about 9 p.m. After a brief rest, the men collected sufficient brushwood to light a small fire, by the light of which we could see that the ungur was just large enough for one man, and that close by was an artificial one, without any more pretence to shelter than a tumble-down rubble wall, nowhere higher than about 18 inches, could afford. To pitch a tent was quite out of the question, owing to the numerous large rocks, so we slept wherever we could, and, thanks to the long and very fatiguing march, many of us were oblivious of the cold.

The minimum thermometer fell during the night to zero Fahr., and what the corresponding temperature in the precincts of the pass was may be guessed from the fact that it had been low enough the night before to freeze to death my hardy, thick-coated dog, whose love of the chase had led him to go in pursuit of a herd of ibex, or burrhel, from Pilipert.

Soon after leaving this bivouac, known as Miskan Jilga, numerous yaks were met, and in a few miles a tent occupied by two Kirghiz, who professed ignorance of the route to the Yarkand river. As far as Miskan, the Kirghiz encampment, the route is comparatively excellent, but further on the valley is so choked up with jungle that progress was considerably retarded, and much damage done to the baggage. Being quite ignorant as to the distance we were from our goal, the Yarkand river, no sights having been taken the previous night, I pushed on till dusk, when it was necessary to halt and patiently await the arrival of the yaks. A ruined house afforded shelter from the wind, and as plenty of good firewood was obtainable, we bivouacked in comparative luxury; but the tired yaks would have fared badly if their drivers had been allowed to keep them tied up all night and without any food, as was their intention. It was only after much threatening and abuse that the yak-men were made to go back a couple of hundred yards to collect chopped straw, which had been abandoned by the last people who had cultivated the comparatively open valley on the north side of the Topa Dawan, on which we now were.

The yak-men being, as usual, very dilatory in loading up the next morning, I went on ahead with a boy who had given a little information to one of my men, and in the course of the few miles which had to be accomplished before reaching the Yarkand river it was ascertained that Yul Bash, who professed ignorance of all routes hereabouts, not only knew the country perfectly well, but had, in the previous year, cultivated some of the fields close to last night's bivouac.

The most welcome news which the boy gave us was that of another route to Pilipert, which he had previously traversed with Yul Bash. It was a great relief to hear this, as, although it would take four days, during which as many passes had to be crossed, yet anything would be better than recrossing the Mamakul pass. Soon after noon the next day the long-wished-for goal was reached, and camp pitched on the right bank of the Yarkand river, with plenty of good dry firewood and some kamish grass for the yaks close by. To reach this camp, which is only about 10 miles distant from the most southerly part of the Yarkand river visited from Nosh Tung, it had been necessary to make ten marches and cross five passes, the tracks being in many places as bad and as dangerous as animals can proceed along.

Owing to the very tired state of the yaks, it was essential to halt for a day, thus affording time for topographical work, as well as for the execution of most needful repairs to the baggage. From this camp I again checked the longitude of the west end of Raskam by means of latitudes and an azimuth of nearly 180° , to one of my hill stations west of the Topa Dawan. Another man having arrived with a few fresh yaks, the lying Yul Bash was afforded an opportunity of pretending that he had just obtained information about the route which the boy

had previously told me was well known to him. Annoying as it was to be obliged to make such a lengthy *détour*, it proved to be most advantageous from a geographical point of view, as from peaks adjacent to four of the passes extensive views were obtained, and the topographer was invariably able to get good fixings at the sites he selected, while the positions of nearly all the camps and bivouacs were determined astronomically.

The return journey to Pilipert was accomplished without any more serious mishap than a yak falling into a deep and narrow crevasse hidden by tall grass. Owing to the valleys being very narrow and



THE MOST WESTERLY BEND OF YARKAND RIVER, TAKEN FROM THE MOUTH OF THE MARIONG VALLEY.

rocky, the labour of clearing a space for two small tents was considered to be far too great and out of all proportion to the extra comfort of sleeping in a tent, so this luxury was dispensed with.

Favoured by comparatively fine weather, we crossed the four passes—one about 17,000 feet—without having any snow to render the vile tracks, often excessively steep, more difficult than they usually are.

The only fuel obtainable at Pilipert being a little partially dried yak-dung, the sight of dry wood, which some Kirghiz had brought up from Kulan Urgi for me, was most pleasant, and in a short time after my return to this bleak spot I was seated in front of a good fire in the only unoccupied stone hut (through which, indeed, the biting

cold wind blew with as much ease as through a sieve), thawing the numerous icicles which hung from my moustache and beard.

Having obtained satisfactory observations for rating purposes at Pilipert, we gladly departed as quickly as possible from this land of liars and trouble for the hospitable valley of Kulan Urgi. After crossing two more passes in one day, Issok Su Aghzi ("mouth of the hot water") was reached about dark, and a day's halt was made there while the caravan was sent for.

Whatever motive or secret order had compelled the Tajiks to withhold information about routes, it must in fairness be said that they one and all faithfully adhered to the bond, as not an iota of news about the direct and easy route from Mariong to the part of the Yarkand river near the west end of Raskam was ever vouchsafed. The boy who gave me news about the return route to Pilipert was not a Tajik, but a native of Kulan Urgi. Large rewards were offered for information about the direct route from Mariong, and once the wily Mohammed Ju, my interpreter, had nearly succeeded in obtaining some particulars, when his informant was promptly ordered by some other Tajiks, who accidentally overheard the conversation, not to give any. It was not until I met some of my old friends among the Kirghiz of Kulan Urgi that I ascertained from one of them, who was well acquainted with the route from Nosh Tung southwards, that it was an easy one, requiring only two and a half days to traverse, and that it was constantly used by the inhabitants of Mariong when taking their herds to graze in the valleys on the right bank of the Yarkand river.

From Issok Su Aghzi I ascended the narrow Kulan Urgi valley, in which there are several Kirghiz encampments, to Zad, to check not only its longitude, but also that of Bazar Dara, with which it was connected by triangulation in the previous winter, and of other places dependent on that of Bazar Dara. On descending the valley from Zad, where I had spent two consecutive Christmas Days, we met the Kirghiz who had preceded me in crossing the Mamakul pass. Their yaks were so footsore that it was only with the greatest difficulty that they were brought back to Kulan Urgi, where they had to be left to rest at the first patch of grass. The Mamakul route was previously known only to one of the Kirghiz, and it is one which is but seldom used either by Tajiks or Kirghiz, the latter affirming that it is by far the worst known to them, and one which they would assuredly avoid for the future.

On reaching the small village of Tir, about 5 miles above the junction of the Kulan Urgi and Yarkand rivers, on December 29, it was stated that the ice on the latter river was not yet sufficiently strong to bear animals, so short excursions were made from Tir, up the Yarkand river to within sight of the limit of surveying done at Sanglash, then to the Kuramut Dawan, and lastly to the Sandal Dawan. Both of these

passes are exceedingly bad and stony. The approaches from both sides are up narrow and very steep valleys, then so full of slippery ice as to render the routes exceedingly difficult for ponies. The Kuramut Dawan, about 14,400 feet, is like the edge of a knife, and is equally bad on both sides; but the Sandal Dawan, about 16,000 feet, is less steep on the south side, this advantage over its neighbour being counterbalanced by the necessity of hauling ponies, yaks, and donkeys up two rocky places, divided by a small ledge on which only a few animals can rest at a time.

By the time these places had been visited and much topographical work executed under the most trying conditions of a very low temperature and biting cold winds, from which some protection was afforded by having a large numnah held up close to the plane-table, the Yarkand river, or Chiung Daria ("big river"), as it is called in this part of its course, was reported to be well frozen over in the necessary places, so the journey was continued northwards, the river being crossed and recrossed repeatedly, often on very clear and slippery ice. By making only short marches, the topographer was enabled to ascend some of the side valleys; cross the intervening ridges, offshoots from the Khandar range, from which good views were obtained; and rejoin the caravan, which kept to the main valley. From Langar northwards, this plan being quite impracticable, owing to the absence of all but the smallest of side valleys, and the precipitous nature of the high barren mountains on either side, pacing had to be resorted to, and was carried on to Kosarab.

This stretch of the Yarkand river is best known as the Zarafshan (literally "full of gold") river, but in practice only a little of that precious metal is found along its banks, chiefly between Kosarab and Ara Tash, but also in other places in very small quantities, and only when the river is in flood. The Danga Bash, or Tashkurghan river, as it is called during the latter part of its course, being still unfrozen on January 11, and far too deep to ford, it was necessary to follow its course for a short distance. In lat. $37^{\circ} 50' N.$, a few miles above the mouth of this river, the volume of which is, I should think, equal to fully one-third of the Zarafshan river, the track is too bad for laden animals. Hoping to avoid the necessity of off-loading, carrying the loads for 200 yards by men, and again loading up, the ice along the right bank was tried. It was, however, very rotten, and broke and cracked so ominously that it was necessary to retreat until the animals could ascend the bank. For some unexplained reason, the centre of the river, now unfrozen, contained a continually increasing number of miniature ice-floes, and in a couple of minutes after I had ordered the caravan to abandon the ice route and return to *terra firma*, a huge mass of thick ice came down the very rapid river, and became so firmly jammed between the ice extending from both banks, that the height of the river

speedily rose for a short time, until the rotten ice upon which the caravan had been a few minutes previously, broke up and allowed the floe to continue its course. Just as the caravan reached the bank a lot of villagers came to render assistance, which was much needed; but even with their help the caravan did not reach the tiny village of Oei Bekai, the last village in this valley, until after dark.

A couple of hundred feet above Oei Bekai the valley is so narrow and the right bank so precipitous, that it is necessary to cross to the other side. In spring and early winter the river is said to be fordable, but when we were there such a proceeding could not be thought of, owing to a dam of rotten ice having formed and raised the level of the river at the ford several feet. With the help of a few doors from the neighbouring houses and some baulks of timber, the two small gaps in this dam were bridged over, and the unladen animals crossed in safety; but so rotten was the ice that even men and unladen donkeys broke through the upper layer in many places.

Much as I wanted to continue up this valley and revisit Uchi, in order to have a fresh check on the longitudes, I was reluctantly compelled to abandon the project. The reported necessity of frequently crossing the Danga Bash river during four days was not pleasant; but my funds were now at such a low ebb that the combined pecuniary resources of the caravan were only just sufficient to cover expenses to Kosarab, where I expected a messenger to meet me with more money.

Leaving the valley of the Danga Bash river at Beldir, the route was up a narrow twisting and deep valley, which rendered it necessary to set up the plane-table very frequently. About halfway up this valley, close to a hut and shelter called Shoti, the valley is only a few yards wide, and in one place the track is supported by a rough scaffolding, so narrow that the ponies' loads had to be carried across by men, donkeys crossing in comparative safety with their loads. For some hundreds of yards the ice in this gorge, above the place where the track is supported by scaffolding, was so slippery, and the gradient so steep, that numerous steps had to be cut before the animals could proceed. Fine snow, which fell all day, rendered surveying on both sides of the Kesin pass (about 12,900 feet, the last pass to be crossed before reaching Kosarab) by no means pleasant; but the useful numnah, or felt rug, held up by a couple of men, kept the snow off the plane-table.

The march over the Kesin pass, on both sides of which there is plenty of grass, having taken much longer than was expected, owing to the troublesome gorge on the south side, we were forced to halt at the first inhabited house, the human occupiers of which kindly vacated it for me, but the other inmates—goats, sheep, some fowls, and a donkey—greatly resented being evicted, and seized the first opportunity to return. Whenever I went out some of the animals and fowls at once

rushed in, and as the process of re-evicting them raised so much dust that it was impossible to see across the solitary room, the thought of keeping them out for good was abandoned, and the dust washed down my throat with as dirty melted ice—the only available liquid—as I have swallowed for a very long time.

The next day we reached Kosarab, whence the Yarkand river was once more ascended for the last time, and a bivouac made at the most distant place that animals could proceed to, and the next day Ram Singh and I paced up to near the mouth of the Danga Bash river, thus completing the survey of the hitherto unknown part of the river known to the Chinese as the Jade river, and to others as the Raskam, Chiung Daria, Zarafshan, or Yarkand river.

The characteristic features of the country travelled through since leaving Uchi, are numerous very deep and narrow valleys, some cultivated, others so full of jungle that baggage-animals often proceed with great difficulty. The intervening ridges are very high and exceedingly precipitous, and are the homes of a few herds of ibex and burriel, while chicore are numerous in the valleys. Between Nosh Tung and the Kulan Urgi valley eleven passes, averaging about 14,000 feet, were crossed in fourteen marches.

With the exception of a small patch of kamish grass in lat. $37^{\circ} 2' N.$, the valley of the Yarkand river from Surukwat northwards is destitute of grass, vegetation being represented by several clumps of trees, jilgan, and chekundo, which is largely used for adulterating the tobacco chewed by many natives.

Animal life is, with the exception of a few hardy lizards which can endure the great cold of winter and the fierce heat of summer, conspicuous by its absence; not even chicore or the common sparrow are found in this stony and barren valley bounded by bleak and bare mountains, generally of the steepest kind, rising to many thousands of feet above the river. In one place where the thickness of the ice on the river was measured, it was found to be 12 inches in mid-stream, and about 20 inches a few yards from the bank. The ice was in many places perfectly clear, sometimes smooth as glass, but occasionally its surface resembled the ripples on the sand after the tide has receded. It is only in the depth of winter, and then only for about six weeks from the beginning of the year, that it is possible to take animals along the valley of the Yarkand river, from near the west end of Raskam to the mouth of the Danga Bash river, and only in an exceptionally severe winter can they proceed direct to Kosarab.

Several circular, and as a rule vertical, cavities in the rocks, sometimes close to the water's edge, and occasionally above the highest flood-marks, attracted attention. The diameters of these cavities varied from about 15 to 24 inches, the height being sometimes nearly 6 feet. As a general rule they were neatly drilled, but that such a depth should be attained was certainly astonishing.

The minimum thermometer never registered any very low temperature, but still, after sleeping in the open for eleven nights, the average temperature being only a few degrees above zero Fahrenheit, good houses and cheery fires were decidedly much appreciated.

From Kosarab the Zarafshan river was once more followed down to where the Yarkand-Khotan road crosses it, a short excursion to the north side of the Sandal-Karamut Dawans being made from Chumdi, in order to execute topographical work which had to be abandoned during the previous winter on account of illness.

Much credit is due to Ram Singh, the sub-surveyor whom the Survey of India very kindly lent me, for carrying on mapping on the scale of 8 miles to 1 inch under very trying conditions, which seriously affected his health. The initial longitude was determined by triangulation from peaks previously fixed, and the closing error was ascertained by observation near Yarkand, at a place the longitude of which was arrived at in March, 1898, differentially from Trotter's observing-station in the Yangi-Shahr, and was checked by an occultation.

Good rates for the chronometer watches were obtained at eight places during the short journey, which, counting from the time I left Uchi until I reached Yarkand, lasted sixty-six days. The positions of thirty-two places were decided astronomically, and the longitudes of about twenty-six camps visited in the previous winter were carefully checked. As a general rule, latitude was determined by three sets to Polaris, and five sets to a south star, a 6-inch theodolite being used. The ordinary time observations consisted of two sets to an east star, and a similar number to a west star, but when observing for rating purposes, double the above number of sets were taken. Observations for magnetic deviation were also taken several times.

From Yarkand I now went to Kashgar, and while there measured a base of about 6 miles for the purpose of observing the mountain designated "Kungur" on the latest map of the Pamirs, better known as Curzon's map. This mountain is about 23,530 feet, or only 870 feet lower than Muz Tagh Ata, and, being almost exactly in line with the latter, effectually prevents it from being seen from Kashgar.

The absence of an escort for the British representative at Kashgar, Mr. G. Macartney, and his very strange official designation, which is far from being understood by the Chinese and others, impressed me very strongly as showing great neglect on the part of whoever is responsible for it. I feel very confident that, although Mr. Macartney at all times willingly did whatever he could for me in every way, it was solely owing to this most apparent want of official support from his superiors that his remonstrances about the treatment I experienced from the Chinese were ignored, and the promises made to him by the Taotai speedily broken. Owing to the opposition of the Chinese, chiefly of the Taotai, and their refusal to afford me due protection while

travelling in territory which, they repeatedly told me, is in their immediate jurisdiction, I was put to considerable extra expense. It was solely owing to the quite unnecessary hardship and exposure undergone during my second visit to the Polu gorge in June, 1899, that one of my men was killed, my journey considerably curtailed, and my own health so much affected that I was laid up in hospital in Simla for two months from rheumatism, etc., from which I have not yet recovered.

Soon after our passage through the Polu gorge with comparatively few casualties, a few men who were sent by the Amban of Kiria to destroy the track—a very easy task—by which we came, in order to prevent me from returning to Turkestan, overtook us while they were *en route* to recall a temporary post which had been established at Aksu—a positive proof that the latter place is undoubtedly in Chinese territory.

At the time camp 110 was reached there was not the slightest improvement in the health of Ram Singh, the sub-surveyor, who was quite unable to do any work; and as my own health was far from good, I most reluctantly decided to go to Ladak, now the only route by which we could leave Tibet. The direction taken was more or less the same as that by which we came from the Lanak La in 1896. Nevertheless, none of the Arguns who had accompanied me in 1896 were at all certain of the route, so I guided the caravan back to the Lanak La, and without having any necessity to refer to the map. Leh was reached on July 21, and as soon as the animals, which it had taken me a long time to collect, were disposed of, a move was made to Srinagar, and thence to Simla, where I remained for two months in the Ripon hospital.

Before concluding this, I fear, far too long paper, I should like to take the opportunity of expressing my heartfelt thanks to Colonel St. G. C. Gore, R.E., Surveyor-General of India, for the very great assistance so freely given to me at all times, not only by himself officially and privately, but by all the officers and officials of the Trigonometrical Branch of the Survey Department at Dehra Dun. Colonel Gore rendered invaluable aid by very kindly lending me the services of, in all, three sub-surveyors, to whom a very large share of credit is due for their skill, patience, and energy, often under most trying conditions. I shall always feel most grateful for this aid, and for the very great courtesy and assistance given to me by this department of the Indian Government, which, I believe, was as much as the regulations allowed. I should also like to tender my sincere thanks to the many other people who assisted me, especially to the Council of the Royal Geographical Society, Major G. Chenevix Trench, Mr. G. Macartney, C.I.E., Captain A. H. MacMahon, C.S.I., C.I.E., and Major W. R. Yeilding, C.I.E., D.S.O.

Before the reading of the paper, the PRESIDENT said: We have this evening to hear a paper on a previously unknown part of Central Asia from Captain Deasy,

and when I tell you that within the last few years he has correctly surveyed 40,000 square miles of new country, you will agree that he ought to receive a cordial greeting from a meeting of geographers.

After the reading of the paper, the following discussion took place:—

Sir THOMAS HOLDICH: It has given me very great pleasure to-night to welcome Captain Deasy back here again, and to hear what he has to say of his remarkable adventure. It is remarkable for more reasons than one, but chiefly for the careful attention he paid to scientific methods and to the scientific requirements of his expedition, so that he has made, as it were, almost a new departure in amateur, or, I might say, non-professional exploration. Other officers before Captain Deasy have taken the trouble to acquaint themselves with all that previous travellers have done in the fields of work to which they have gone, others also have taken care to secure the data necessary for their work, but few, and indeed I don't think any, have chosen such an exceedingly difficult ground for their experiments. Basing his work on the Pamir Surveys of 1895, Captain Deasy has shown us once again, if it were necessary, that it is possible to carry a triangulation across the most desperately difficult mountainous country, if only a man has energy enough for the incessant hard work of mountaineering, and ability enough, coupled with that intuition which enables him to recognize in a vast sea of mountains those particular points to which he has to make his observations. Difficulties like these are quite enough to stagger even a very experienced surveyor. However, Captain Deasy has willingly given up all the possible delights of shikar and the pleasures of unhampered travel to sacrifice himself conscientiously to the cause of scientific geography. Colonel Gore, the Surveyor-General of India, has told me that over all that extent of country which he has described, over 40,000 square miles, the scheme works out correctly, and more than this it is impossible for any man to effect. There is one point which is of peculiar interest to me, and that is the determination of the altitude of that great peak Muztagh-Ata, the great snow-mountain that Sven Hedin unsuccessfully endeavoured to ascend. He got very near the top, but failed to reach the summit. While we were in the Pamirs, it was never clear enough for us to be positively certain whether we had taken observations of the highest point of that mountain, but Captain Deasy's work sets the question at rest, and we know for certain that Muztagh-Ata is so far the highest point fixed north of the Himalayas, and it must remain at present king of the mountains of the trans-Himalayan country.

There is another aspect of the question, which one cannot go very much into in this place, and that is the political advantages which may arise from Captain Deasy's work. At the close of the Pamir Boundary Commission there was still a region in which international interests might be regarded as in a nebulous condition, to the east of the Pamirs, and as the time will certainly come when these questions will have to be settled, it must be of enormous advantage to the Government to be able to act on a basis of something like certain geography instead of making agreements based on geographical guesswork.

There is no doubt others, beside myself, will have something to say about his most interesting work. I will only say, from a surveyor's point of view, I consider the work done one of the most important contributions to scientific geography in Asia that we have had of late years.

Captain KENNION: The very modestly written paper to which we have just had the pleasure of listening, describes in a very compressed way Captain Deasy's wanderings during the space of two years in one of the most inhospitable regions of the world. It has been very interesting, but I think we must agree that, considering the distance covered and the time spent in almost continuous travelling, it has

been all too short. I hope he may later afford us an opportunity of reading an account of his travels in an amplified form.

The point about Captain Deasy's work which will, I think, specially appeal to the Fellows of this Society, is the thoroughness with which he explored the country he selected for his travels; unlike many travellers, who take a bee-line through a more or less unexplored country to the place they have set before themselves as a goal, and then simply hurry back to England to tell people what they have done, Captain Deasy not only explored but scientifically mapped the whole of the district he travelled over, linking it up with the triangulation system of British India, so that there now remains little or nothing to be learnt about this country from a geographical point of view.

There is one remark of Captain Deasy's about which I should like to say a few words. This is where he expresses a hope that the status of the British representative at Kashgar will be raised by furnishing him with an escort presumably of British-Indian troops. I gather that he would also be glad to see the establishment of what may be called a sphere of British influence in Chinese-Turkestan. I cannot myself agree that the large expenditure involved would be in any way justified or followed by corresponding advantages. Mr. Macartney's duties in Kashgar are, like my own in Leh, mainly connected with the trade between British India and Central Asia. Though at one time there were hopes that this trade would attain considerable proportions, it is now quite clear that these hopes will never be fulfilled; the trade is declining year by year, and the causes of the decline are such as seem to admit of no remedy. The reasons of the decline are Russian competition fostered by bounties and the near approach of Russian railways. It is also due to taxation imposed by the Government of India on the importation of the hemp drug known as charas, which has been the staple export from Chinese Turkestan to India. This drug is extremely injurious to those addicted to its use, and the action of the Government of India in this matter cannot be considered as other than wise and beneficial.

In spite of the hopelessness of the task, very strenuous efforts are, of course, being made by the Resident in Kashmir to promote this trade by every legitimate means, but, as I said before, no great measure of success can be hoped for.

From a political point of view, I must say I see no object in trying to create a British sphere of influence in Chinese Turkestan. Buffer states are all right in their place, but five years' residence in the Himalayas at Gilgit, at Chitral, and at Leh, has convinced me that none is needed here, and that nature's formidable barriers are themselves ample protection to India on the north. If doubt still lingers in any one's mind on this point, it should be dispelled by the lessons of the present war. As a matter of fact, so far from British prestige being on the wane in Chinese Turkestan, it was never higher than it is now. I lately received a letter from Mr. Phelps, who has gone to shoot big game in the Tian-shan mountains. After describing the enthusiasm with which he and his fellow-traveller were received in Yarkand, all the merchants of the place turning out to escort them into the city, he says, "We could not help feeling proud of being Englishmen."

I do not think this looks as if British prestige is on the wane. Nor is it. Although in my opinion a moribund trade cannot be built up, I believe there is a far more hopeful field for energetic commercial action open to us in Tibet. This country is as a market, to all intents and purposes, of virgin soil. It is as much outside the Russian sphere of influence as Chinese Turkestan is outside our sphere. Its commercial capabilities are, I believe, greater than has hitherto been suspected, though one traveller, Captain Bower, in his book, dwells at some length on the magnificent prospect which would be open to Indian tea-growers, if the prohibition against the import of the Indian leaf were to be removed.

The commercial invasion of Tibet is not by any means so outside the sphere of practical politics as is generally believed. Last autumn I visited the town of Rudok. I believe I was the first Englishman to do so, and whilst there had some long talks with the governor of the place, a by no means unintelligent Lhasa official. Though he had perforce, for his own safety, to maintain a hostile and irreconcilable attitude, he had no real antipathy to Europeans, while the common people, who are born traders, were delighted to see me, and considered the advent of an Indian official in their midst as the commencement of a new era of prosperity for them.

The generally hostile attitude of Tibetans to Europeans is entirely due to the efforts and orders of the Lhasan priesthood, who fear for their supremacy if British influence were once felt in Tibet. No one who has any knowledge of this extraordinary organization can doubt that this would be a result much to be desired, in the interests of those crushed beneath the tyranny of the monasteries.

Even the opposition of this priestly class is, I believe, by no means so insuperable as is generally imagined, and I feel sure that if steady pressure is brought to bear upon them in the numerous ways possible, the closed doors of Tibet will soon begin to turn on their hinges. I fear I have strayed somewhat from the realms of pure geography, and must conclude, but in doing so must express a hope that Captain Deasy will again find his way out East, and will then turn his attention to the exploration of some of the unknown regions of this country.

The PRESIDENT: Sir Thomas Holdich has given us a very clear idea of the value of Captain Deasy's scientific work during his explorations. It is now thirty years since we began to receive geographical accounts of these regions, then called the dominions of the Usbeg, or Ghazsie, from Mr. Hayward and Mr. Shaw, and since that time we have had the accounts of a great number of travellers in this region. It is therefore very high praise, but most deserved praise, to say that Captain Deasy's work, certainly as regards the resolution and determination he has shown, and the value of his scientific work, can be compared with and is equally as good as that of previous travellers—I say it is saying a great deal when among those previous travellers are such men as Younghusband and Littledale.

It was only by the aid of his photographs that we could form even a most distant idea of the difficulties of what he calls roads, that look much more like walls with flies crawling up them than roads suited for the passage of yaks and mules. But nothing seems to have stopped him in his determination to explore the upper valley of the Yarkand; and we must all congratulate him most sincerely on the success of his most difficult expedition. In moving a vote of thanks to Captain Deasy, I think we must include, not only his most interesting paper, but also his kindness in showing us these clear and excellent photographs, and also, I think, for the pains he has taken that his delivery should be so clear and distinct.

NOTE ON THE MAP.—This map is a reduction from sheets 1 and 2 of "Map of portion of Tibet explored by Captain H. H. P. Deasy, 16th Lancers, in 1896," and of sheets 1 to 5 inclusive of "Map of Portions of Western China and Tibet, explored by Captain H. H. P. Deasy in 1897-98-99," which were published under the direction of Colonel St. G. C. Gore, B.E., Surveyor-General of India. These sheets were compiled in the Trigonometrical Branch Office, Dehra Dun, by J. Eccles, Esq., M.A., Superintendent Survey of India, from the original records of Captain Deasy's exploration.

The longitudes on the eastern portions of this map are based on the following points of the Great Trigonometrical Survey of India, viz. Tartary No. 1 peak, Tartary No. 2 peak, Mangtza Lake No. 1 Peak, and Kiun (Kwen) Lun No. 2 peak,

and on the western portion they are based on Pamir 5 h and Taghdumbash h of the Pamir triangulation. The longitudes were extended as far as possible by triangulation, and when this was no longer feasible chronometric values were employed; they are referable to the Greenwich meridian, taking that of Madras Observatory $80^{\circ} 17' 21''$ E., and they require a correction of $-2' 34''$ to make them accord with the most recent value of that observatory, viz. $80^{\circ} 14' 47''$ E. The latitudes employed throughout were astronomically determined.

The heights in the eastern portion of this map are based on the fundamental height of Camp 3 of 1896, which was obtained from a series of observations with a mercurial barometer at various camps, the relative heights of which had been determined by triangulation. The observations were computed differentially from Leh by means of simultaneous observations recorded there. In the western portion they are based on the heights of the Pamir Triangulation. A six-inch transit theodolite was invariably employed.

AN OROGRAPHIC MAP OF AFGHANISTAN AND BALUCHISTAN.*

By Colonel Sir T. H. HOLDICH, K.C.I.E., C.B.

THE orographic map of Afghanistan and Baluchistan which is published in this number of the *Journal* is designed to illustrate, on a sufficiently small scale to be readily appreciable, the main structural characteristics of that part of Asia which lies to the west of the central Tibetan and Pamir plateaus, and the general analogy which exists in the construction of the two areas. To illustrate this structural relationship more fully, I will refer shortly to the views held by those modern geographers who have had the best opportunities of examining the mountain masses to the north of India, on the subject of the Himalayan conformation. These views are well epitomized in the articles on "Asia" and the "Himalaya," contributed by Sir R. Strachey to the 'Encyclopædia Britannica.' Although these articles were written many years ago, the researches of such recent observers as Godwin-Austen, Lydekker, Griesbach, Oldfield, and Tanner have adduced nothing which greatly modifies or affects the opinions therein expressed. Sir R. Strachey points out that "the Himalaya, with its prolongation west of the Indus, constitutes in reality the broad mountainous slope which descends from the southern border of the great Tibetan tableland to the lower levels of Hindustan and the plains of the Caspian; and that a somewhat similar mountain face, descending from the northern edge of the tableland, leads to another great plain on the north, extending far to the eastward, to the northern borders of China. Towards its north-west territory this great system is connected with other mountains—on the south with those of Afghanistan, of which the Hindu Kush is the crest, occupying a breadth of about 250 miles between Peshawar and Kunduz; . . . nor can any of the numerous mountain ranges which constitute this great elevated

* Map, p. 596.

region be properly regarded as having special, definite, or separate existence apart from the general mass of which they are component parts; and Tibet cannot be rightly described, as it has been, as lying in the interval between two so-called chains of the Himalaya and the Kuen Luen or Kara Koram. It is, in truth, the summit of a great protuberance above the Earth's surface, of which these alleged chains are nothing more than the north and south borders, whilst the other ranges which traverse it are but corrugations of the mass more or less strongly marked and locally developed." Further on he says that it is "the northern border of the tableland" of Tibet, "or the summit of its northern slope, so far as it is known," which "seems to form the real watershed between the rivers which flow to the Indian ocean, and those that lose themselves on the plains of Turkestan and Mongolia. The summit of the Himalayan slope forms a subordinate watershed separating the rivers which fall into the Indian ocean into two classes, those that pass directly through the Himalaya to the plains of India and those that are collected on the summit of the tableland and discharged, also through the Himalaya, but by two concentrated streams at distant points towards the opposite ends of the chain." This "subordinate watershed" he refers to as the "Indian watershed." As regards the forces of nature which led to this structure, after noting the inference that the great line of peaks which constitute the "Indian watershed" is due to a primæval line of elevation on the ancient land, and that the movements which raised the subordinate ranges on either side are of later date ("after the middle Tertiary epoch") and coeval with those which raised the tablelands of Afghanistan and Persia, Sir R. Strachey suggests that "such changes of level as are observable on the Himalaya should be regarded as due rather to secondary actions consequent on the general contraction of the cooling terrestrial sphere than to direct elevating forces for which no known origin can be imagined," the effect of this contraction being to set up great horizontal strains, partly of tension and partly of compression, along lines which are approximately parallel, or, under certain conditions, at right angles "to one another and to the line on which the greatest compression, and consequently tension, takes place," and he considers that "it is hardly possible to doubt that the main direction of the principal rivers were determined by anterior lines of dislocation," "the parallelism of many of the great Tibetan and Himalayan rivers for hundreds of miles together, amid such mountains," seeming to be "wholly inexplicable in any other manner." Presumably the structural effect of this "secondary" process of contraction may also be held to account for those transverse watersheds which connect the parallel ridges, as well as for the cracks or fissures in them which admit of the passage of main drainage lines almost at right angles to their general strike. But such a feature as the splitting asunder of the main chain of a mountain system by the main

arteries of its drainage (which is common to most of the mountain systems of the world) may be also accounted for by the theory of antecedent drainage, *i.e.* that rivers have clung persistently to their old channels, whilst the mountains have been upheaved across their path; and it is this theory which seems to be best sustained by the geological examinations of the recently surveyed areas of Afghanistan, Baluchistan, and Persia.

Godwin-Austen is inclined to separate the main structural lines of the Himalaya into distinct groups, and to attribute the position of the main geologic axis of elevation of the entire system to the chain of the Mustagh and Kara Koram merging into the Tibetan plateau, separating this line from the Kuen Luen; and he definitely decides that the main chain, or line of highest peaks, of the Himalaya, is that which includes Nanga Parbat on the extreme north-west, and, passing to the north of Nipal, is dominated by Kanchinjunga on the south-east. This is the recognized "snowy range," the range of highest altitudes (averaging 18,000 feet above sea-level), the same range which Strachey calls the "subordinate" or "Indian" watershed. But whatever may have been the structural principles involved, there can be no doubt about the general analogy of mountain conformation throughout South-West Asia.

A glance at the map now published is enough to prove that the tectonic influences which built up the Central Himalaya in pre-Tertiary times, and subsequently added the tablelands of Afghanistan and Persia, have reproduced on a smaller scale, but with much more clearness, the same system of central highland elevation, flanked by the same parallel flexures and corrugations, traversed obliquely by main lines of drainage, as are the ruling, but not always obvious, features of the Himalayan structure.

The meridional range of Sarikol, to the east of the Pamirs, is a typical mountain system consisting of two parallel ridges, of which the eastern is the dominating chain, admitting the passage of main drainage lines, and the western is the true water-divide. To the west of it we have the configuration of the Tibetan plateau more or less repeated, first in the elevated Pamir region, next in the Badakshan plateau, and finally in the tablelands of Afghan Turkestan, merging into one another and into the northern Persia highlands. The Hindu Kush flanks the Pamirs and the Badukshan plateaus, just as the Himalaya flank Tibet. The great longitudinal trough of the Indus and of the Sanpo, beyond the Himalaya, is repeated by the Oxus from Chakmaktin to Ishkashim; by the extraordinary trough of the Hari Rud from Doalatyar to Kuhsán; by the Murghab; and in a minor degree by the Andarab and Bamián streams, and (as we shall probably find out eventually) by the Minján. But all these rivers (except the Hari Rud) break northward after rising under the crest of the southern flank of the plateau, and pass through the containing ridges on the northern side of it to the plains of the Oxus. The Hari Rud alone breaks through the southern flanking

chains, rising in the Hazara highlands, which are but an extension of the central plateau southward from the Hindu Kush and Koh-i-Baba. Here we have, from Tibet to the passage of the Hari Rud through the Paropamisus, an immense extent of mountain chain coincident with the main or central water-divide. Sometimes this chain dominates the mountain masses around it, sometimes it sinks to comparative insignificance. As the Muztagh it is a mighty mass of impassable peaks and precipices, but as the Hindu Kush it is distinctly secondary to its own magnificent offshoot the Shundur range. The Hindu Kush only rises to a position of dominance as it approaches Kabul and culminates in the Koh-i-Baba. Beyond the Koh-i-Baba, westward, the Paropamisus (as the bounding chain, or southern wall, of the Firozkhoi plateau) is little more than the scarp or edge of a highly elevated plain. To the south of the great central water-divide, we have the systematic folding of parallel flexures, apart from the main chain, and connected by transverse watersheds (the counterpart of the minor Himalayan chains), strongly emphasized in the Koh-i-Sufed south of the Hari Rud, and the lower ridges which flank it.

But in order to observe the lines of Himalayan structure in a condition of almost primitive simplicity, free from local irregularities and amplifications, we must turn to the frontiers of India and Persia. Here the retaining mountain walls, or revetment of the central plateau, are often indicated by a broad band of ridge-and-furrow formation, dominated by a massive chain of cretaceous peaks (where we may find masses of limestone piled to a thickness of 3000 or 4000 feet), split by the drainage from the plateau, which passes by a series of magnificent gorges on a course obliquely inclined to the strike of the range, to the flats of the Indus provinces.

The central limestone chain on the Indian frontier overlooks a succession of narrow sharp-edged ridges of Eocene and Siwalik formation, which, in a descending scale of altitude, intervene between it and the plains of India. So narrow and so regular, so closely packed, are these ridges in many parts of the frontier that it is quite beyond the limitations of the engraver's art to represent them properly. They would, on the scale of the map, appear as simple scratches on the paper. The main chain of the Sulimani mountains attains an elevation of 11,000 feet above sea, and averages between 8000 and 9000 feet, the plateau to the west averaging 4000, and the plains of the Indus being less than 1000 feet.

The frontier districts which exhibit this formation in the most marked degree are those which enclose the upper tributaries of the Zhob and Kunder, and the hills of Makrán. In Persia the regularity of the system is more or less disturbed, but it is easily traceable along the entire coast-line, the parallelism of the ranges being specially marked about Bandar Abbas, whilst the phenomenon of transverse watersheds is plainly indicated in certain minor ranges north of Kirmán.

Throughout all this region the independence of main water-partings, or divides, and main flexures, or mountain chains, is strongly marked. Indeed, it not infrequently happens that the longest and most continuous water-divides are to be traced along lines transverse to the main ridges. Examples of "antecedent" drainage are abundant, as are also instances of that process of "cutting back" by which the head of a river gradually works upward, appropriating fresh areas and enlarging its catchment basin. A notable feature in the map is the vast area of hydrography which has no ocean outlet, the drainage losing itself in the vast lagoons and "hamúns" of the Helmand, Mashkel, Lora, Jar Morian, and other minor lakes and swamps.

A JOURNEY THROUGH SOUTH-WEST SECHUEN.

By EDWARD AMUNDSEN.*

It was snowing lightly as we left Mili Gen-chen on January 10, 1899, the first snow since leaving Chetog. A few farmhouses were seen on the steep hill slopes. Next day we crossed the high pass of Si-li-shan. We halted for tea on the high snow-covered plateau, and met a good number of muleteers *en route* for Ta-chien-lu, as we ascended the gentle slope to the summit, which was reached at noon. From this point we expected to get a view of low-lying level country, but to our dismay nothing but mountain after mountain could be seen in any direction, and to the south a blue haze, which I understood was caused by the heat. A steep descent brought us down to fine grassy pasture ground, sometimes made use of by Lolos, who keep the people hereabout in great dread. At the bottom we crossed a stream by means of a wooden bridge, where I was shown the mouth of a remarkable cave, which is held as sacred by pilgrims, who come from far to make a journey in it. It is said that a journey of twenty days may be made in this capacious cave. During these later years, however, the people are forbidden to enter it, as many who went in never came out again.

We stayed this night in a village of five houses, and the next day halted for breakfast at a village of ten or twelve houses—the last in Mili. An hour's ride further brought us to the border-line between Mili and Yung-lin, which is also the boundary between Se-chuen and Yun-nan. After crossing the border we entered on a long populous plain, which becomes wider as one gets nearer the head village, where there is a Chinese yamen, or rather a poor shed called by that name, with two stone lions in front, to lend some appearance to the place.

* Continued from vol. xv., p. 625. Received after the publication of the first instalment. Map, p. 596.

Near by is also the palace of the King of Jang, who is not a lama like the Mili potentate, but a "layman." The runner from Mili handed his charge over to this king, who treated us very courteously.

Yung-lin is not a town, but rather a big plain full of small villages. A fine river divides the plain into two parts, and is joined by a small river from the north-east. The united stream flows in a southerly direction, and empties itself into the Kiu-chiang (local name for Yang-tse-chiang) south of the great bend. The climate here is bracing, though the sun is hot. The people dress mostly in clothes made from hemp grown on the plain, and are like Chinese in features and habits, but really are not. The religion is Tibetan, and a large proportion of the population is purely Tibetan, and speaks that language, though the language of Jang proper is different from either Chinese or Tibetan. They came in numbers to visit me, and were most polite and kind.

I here got an escort of two men, and set out again for Tsong-tien (or Che-tang) on the 15th, and crossed the difficult pass of Gu-lo-dia; stayed over-night in the village of To-hua, and reached the "river of golden sand," or, as it is here called, Peh-shui-chiang—clear-water river—the next day at noon. I was greatly astonished to find the bend so far north, but so it is, the older maps to the contrary notwithstanding.* The tract to the south within the loop is subject to Li-kiang, and is called by that name. The main stream receives from the north a tributary called Tsong-tien (or Shu-ji), which serves as the boundary here between Mili and Jang; also between Se-chuen and Yun-nan.

We crossed the tributary stream on a kind of raft made of inflated skins, about thirteen in number, tied under a bamboo frame about 5 feet square. A few of our belongings were placed on it, and one passenger, who had to sit perfectly still for fear of capsizing the whole affair. When all was in order, the man, with an inflated sheepskin tied on to his stomach, swam over the swift river with the raft in tow, repeating the process till all were ferried across. It is as exciting as curious, but is the only way of getting over, and the skins and sticks have to be collected in a distant village out of the traveller's sight. We waited till nearly dark before the men came, each with his skin and sticks, to help us over. On the 18th, after leaving the almost precipitous pass of La-mo-tso, I was shown a tree on the southern ridge of the summit, which they said marked the boundary between Mili and Tsong-tien. The bend of the Yang-tse touches the southern corner of Se-chuen. We passed the villages of Mo-shi-do, Drong-tse, and Ko-tse, and proceeding up a fine valley rich in gold, iron, and coal, ascended the pass beyond to the Che-tang plain. This pass is very much dreaded because of robbers, but we did not fall into their hands. The Che-tang plain is high and cold, but prosperous for miles around the town of Tsong-tien.

* This confirms M. Bonin's statement. Cf. *Journal*, vol. XIII, p. 532.

The people here are distinctly Tibetan in features, habits, and character, and are ruled by lamas, who have their great centre about 5 miles north of the town. The resident monks number about three thousand, and are strong enough to make the entire population obey their selfish demands. The Chinese official at Tsong-tien confessed "we stand powerless before them," although there are three Chinese yamens and twenty-three small Tibetan officials in the town. The country all around is notorious for robbers. The town itself is built on the gentle slope of a small hill facing the east, and has a population of 2500. It is attractive by reason of its situation, temples, and fine buildings. It was interesting, after the deadness of Mili, to find some activity in the way of trade. There are constant strings of mules passing, carrying sugar and cloth. Tsong-tien is famous for its ponies, a number of which are sent to Burma. The climate is quite severe in winter, but fuel is plentiful.

Having reached this, to us, interesting centre, we thought ourselves out of the reach of cruel men, but found ourselves mistaken, for, after leaving Tsong-tien, my Tibetan was nearly attacked by lamas for bringing, as they alleged, a foreigner into the country, and not till we had crossed the high Shang-hal pass and reached Ge-lu-wan, on the left bank of the Kin-sha-chiang, were we out of the reach of these anti-foreign lamas. I imagine that European settlers in Tsong-tien will be sorely tried by these monastic champions, who, strange to say, are even endowed by the Chinese Government. The descent from the Shang-hal pass to the banks of the Kin-sha-chiang must have been 9000 feet. We were now obviously nearing Chinese civilization: the well-built houses and tilled ground all spoke of this. The fine palm trees by the roadside were a charming sight. Rice, vegetables, and oranges could again be indulged in—a pleasant change indeed after barley flour and buck-wheat.

We crossed the mighty Yang-tse on January 30 by means of a raft of logs, and entered the big village of Jui-tien with great pomp, having four or five soldiers to escort us, besides a good turn-out of inquisitive sightseers, who declared they had not seen a foreigner before. Another two days' march brought us to the "Fu" city of Wei-shi. This city, with about three thousand people, lies in a ravine open to north and south; food and fuel are very plentiful and cheap. Trade is fairly lively, carried on with Tibetans and Li-sos. We stayed here over the Chinese New Year, enjoying the rest very much.

Getting fresh horses, we set out on February 13 for Li-kiang, as west of Wei-shi there is nothing but Niutses and Chiutses—"wild people"—and we were not equipped for such a journey. We returned to Jui-tien and followed down the right bank of the Kin-sha river, and left it again almost opposite the village of "A-sha;" ascended the gentle pass of La-si-mu, from which a gradual descent brought us to the plain of

La-si-ba, with its beautiful lake and villages. Only a small hill now intervened between us and Li-kiang, which we crossed, and came in view of the city, Saturday the 18th. This city, which is too well known for me to say anything about it, may well boast of its fine climate and charming scenery, having as a background a sublime snowy range which may be seen far and wide. The city is a Li-so city, and the Li-sos are anything but friendly towards foreigners. As we left on the Monday following, the cry "Kill the foreign devil" was heard from every quarter.

From Li-kiang I went to Tali *via* La-si-ba, through Kiu-ho and Jen-chun, arriving on Saturday the 25th. The country from Li-kiang to Tali is an exhibition of nature's most lovely features. From Tali it was my intention to take the shortest route back to Ta-chien-lu. For the sake of convenience it may be divided into four parts.

1. TALI TO YUNG-PEH.—We left the former place on March 4, 1899, skirting the northern end of the lake, passed Kiang-wei (near which is a coal-pit), Huang-jia-piu (here are a number of Roman Catholic converts), and reached Chin-kiang on the 8th. We crossed the river at this place by a good ferry, the river itself being shallow and rapid. The country from here to Yung-peh is fairly well populated and very fertile.

We arrived at the city on the 11th, having crossed a tiresome pass before entering. Yung-peh is situated in a fine plain a little lower than Li-kiang, has a good wall, but is not a busy place.

2. YUNG-PEH TO JIU-YA-PIN.—Here are two roads, the "small" and the "great;" I chose the latter, though a couple of days longer; but it was miserable going over rock and cliff, through watercourses and ravines, with no inns to speak of, few people, coarse fare—altogether a dismal road. Jiu-ya-pin was reached after six days' travel. The town is in a hot plain surrounded by high hills, and has a population of 3800, a good many of whom have accepted the Roman Catholic religion. These spoke as if they looked for the partition of China with joy.

3. JIU-YA-PIN TO MIEN LIN.—From Jiu-ya-pin I set out with an escort of two men, intending to go up by Yen-yuen-hsien and through Southern Chalang to my destination; but after crossing the border-line of Se-chuen my escort left me, going off to the nearest official to hand over their charge, and I never saw them again, so when I reached La-sa-tien, I could get no escort through the Lolo country to Yen-yuen, and it is far too wild to go without. The Lolos, in their lawless condition, plunder all they think themselves a match for.

My men pleaded with me, saying it would be a pity if, after having come through so many dangerous places safely, we should fall into the hands of these Lolos; so we returned to the big river, and followed it to the junction with the Kin-ho (or Nak-chu), which appears even larger than the so-called big river. Here I left the main road and went north

by the right bank of the Kin-ho—an awful road—crossing that river at Ta-pin-ti, a big village, beyond which we managed to drag our horses along perilous cliffs to the town of Sa-lien, a big busy centre. We then entered what may be called the Jien-chang valley. We passed numerous towns from here to Mien-lin, on the banks of the An-ning river, the most important being Pan-lien-keo, Ning-yuan-fu, Li-chau, and Lo-ku. The road is fairly level and good, traffic considerable, food good and cheap, climate better than Central Se-chuen, and people polite.

4. MIEN-LIN TO TA-CHIEN-LU.—We reached Mien-lin on April 8, and set out again on the 10th through the Lolo country.

Almost as soon as one gets outside the city, Chinese are scarcely to be seen. They have a great dread of the Lolos, and do not mix with them; while the Lolo feels like a fish out of water among the Chinese, who generally treat him with great contempt. The route I intended to take had been opened by soldiers the previous year, and the Lolo chief captured and shut up in the Mien-lin yamen as hostage for future travellers. Because of this, the official could not well refuse to let me go, so he sent an escort, while at Ta-chiao a couple of Sifan were added. Thus, with four runners, we set out from Ta-chiao into the wild mountainous country, over a snowy pass, and just before dark got to the Lolo village of Yeli. It was cold, and raining hard, and at first the headman of the village utterly refused to take us in; but we forced ourselves upon him, and when my men explained what a great (!) man I was, he became very polite, and, pleading ignorance, apologized for his former conduct. The houses were poorly built of wood, roofed with boards, open to rain and snow.

Writing of these Lolos, the Rev. W. M. Upcraft says, "the men wear a loose blouse and wide, short trousers made of blue cotton cloth, over which a stout plaited felt cloak is thrown, which reaches from the neck to the knees, and is useful by day in cold or wet weather, and at night forms an ample covering." As far as I remember, they wear long trousers too. To quote again from the same writer: "One peculiar feature is their manner of dressing the hair. Instead of wearing a queue in the way adopted by the Chinese, the Lolos allow the hair to grow long in the front, then braid it into a kind of horn above the forehead, so that it becomes the most conspicuous object about them. Their women-folk wear a short jacket, often finely embroidered, over a plaited skirt, not unlike a Scotch kilt. Their feet and ankles are bare—a fine contrast to the cramped, deformed feet of the Chinese women." They have well-formed figures and even features. The ease with which they go about their work attracts the attention and wins the admiration of the traveller.

On this special occasion I found the whole family sitting round a big log fire, watching the cooking of a cow, which had died from the cold, in an enormous iron pot. When they considered the carcass

cooked, the housewife took a big wooden spoon, several feet long, and shovelled the contents of the iron pot into small tubs, which were placed before each man, likewise a good supply of rice. Wooden spoons were used in eating; chopsticks I did not see. The tubs were carefully watched, and replenished as soon as a diminution became noticeable. When the principal performers could no longer indulge, the tubs were passed to the younger and inferior members of the household, and between them all they managed to put out of sight both cow and rice. Beds were not in use, so I was offered the use of the grain chest—quite a dignified place compared with the rest.

The next stage was the worst and most dreaded, so two Lolos were to escort us instead of the Sifans. They were each armed with a long knife, and were quite "rigged up" for the occasion; but before we had gone very far, both disappeared, leaving us to make our way without guides through the dense forests, except for the services of a Lolo, who was carrying a load. Just when we got to the wildest part, however, he put down his load and went into the wood to call some other man to carry, as his turn was up, and he appeared no more. My man took up the load, and the Chinese runner, who had some years before been over the road, undertook to guide us.

By roaring torrent and mountain cliff the road led us, muddy and slippery, while the mist enveloped us on all sides, and we had to hurry along in order to make a house before the darkness came on. To our astonishment, two men came after us from the last stopping-place, and went with us to the next village, where they gave their charge over to others. I thought we were getting along nicely, and so rode ahead, but was called to halt, the escort having run away, and the carrier left his load, so I had no resource but to strap the load on to the horse and walk beside it. At midday we halted for food and rest outside a suspicious-looking settlement of Lolos, who eyed us curiously as we went over the last high pass through slushy snow nearly up to our knees, at times falling full length in the watery mass. We passed two guard-houses, held by Lolos, under official supervision. Just before dark we came to the village of Tung-tsang, where there was a rough Chinese inn, but it was a shelter from the downpour of rain through the night.

Next morning some cold rice was heated up, and an attempt was made at breakfast, but even the Chinese runner did not feel like eating, so the rice was made into a ball, and taken along to be eaten on the road, when we were sufficiently hungry. We passed many Lolo huts by the way, and soon reached Tzu-ta-ti, a big busy village in a small plain on the right bank of the Tung river. From this point the country is Chinese again. We continued over high and difficult passes—a mass of them—so bad that we had to pull the horses up after us, sometimes carrying the loads ourselves, because the road was so narrow: again over rushing torrents, which nearly carried the beasts away.

Over some of the larger streams there were suspension bridges. The country is sparsely populated. From most of the passes one could see the magnificent snow-clad ranges around Ta-chien-lu. My Tibetan was much elated, shouting "Glory!" to which I answered "Amen," as we saw but one snowy ridge intervening between us and our destination.

Mo-shi-mien is a fair-sized village, comfortably warm, though we did not stay here, but hastened up the mountain-side till, late at night, we found shelter in a poor shanty, ate some Indian meal porridge, and slept on a bed capable of holding eight coolies. We were up in the early morning and away through the dense forest that supplies Ta-chien-lu with building materials, and tramped through the heavy snow on the pass; then down again several thousand feet to Ta-chien-lu, where we were heartily welcomed by Mr. and Mrs. C. H. Polhill, and others, at the mission house there.

The journey occupied from December 12, 1898, till April 18, 1899, and, though not undertaken for scientific purposes, is not, I hope, without interest.

THE EMERALD MINES OF NORTHERN ETBAL.*

By DONALD A. MAC ALISTER.

TOWARDS the end of last year, Messrs. Streeter & Co. equipped and dispatched an expedition with instructions to proceed to the so-called "Cleopatra's Emerald Mines," in the Jebel Sikait district (Northern Etbai). The expedition, which consisted of Mr. A. A. Forster, Dr. Grote, myself, and three Cornishmen, set out from Daraw on December 14, 1899. In our baggage train were 130 camels, each camel carrying from 2½ to 3 cwt. of tents, equipment, and tools, with all necessary supplies for four months.

Leaving Daraw, we plunged at once into the desert, travelling north-east to Wadi Shaid. On the fourth day after leaving Daraw we reached our first watering-place at the Galt (or reservoir) called Um Selim. The reservoir is situated in a small tributary off Wadi Shaid, and is accessible to camels to within 100 yards. The reservoir is in sandstone, and is 45 feet across, and probably 6 feet deep. The water is slightly milky in colour, and contains green weed; but is good, and is fed for a short time after there has been rain by a small flow issuing from a crack in the rock.

After leaving Um Selim and riding for about two hours up the well-defined wadi with its sandstone bluffs, we reached Wadi Mueila, which branches off Wadi Shaid at this point, and forms with Wadi Sibrit an alternative route to Sikait, converging again at the Abu Had

* Map, p. 596.

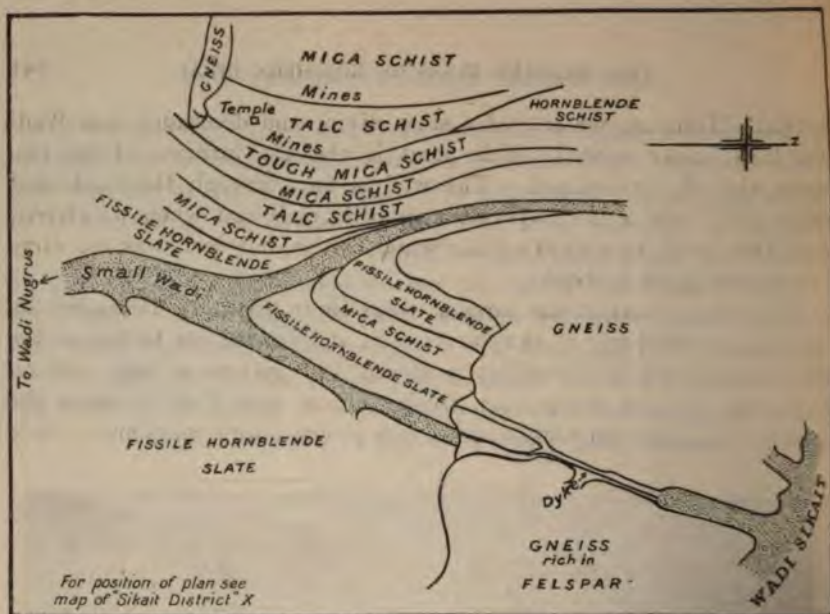
are two wells yielding a copious supply of sweet water at a depth of about 15 feet. The sands of this wadi rest on a bed of impervious crystalline rock. Continuing this route, Wadi Sibril is left, and Wadi Hamesh is followed until Abu Had is reached, the latter part of the route being some hours south of Mijif.

The Wadi Shaid route—the one we chose—has a direction slightly south of east, along the southern flank of Jebel Sufra. Wadi Shaid becomes more open, until it is simply a plain surrounded by low hills. The watercourses are indicated by sparsely distributed mimosa trees, and a fair growth of low scrub called Gash, or Basilla, which afford good food for camels. Mr. Floyer calls this a “plain with trees.”



IN THE DESERT: HALFWAY TO THE MINES.

Before we arrived at Jebel Sufra, round the south of which Wadi Shaid runs, the crystalline rocks began to crop up, and after passing Jebel Sufra, which is a fine hill, marked by Mr. Floyer as being 1200 feet, we continued eastwards, and came along the foot of Jebel Khuruj. According to the map prepared by Mr. Floyer in the expedition sent by the Khedive, we should have to go much farther north (about 9 miles) to reach Jebel Khuruj. This mountain, therefore, is indicated on Mr. Floyer's map about 9 miles north-west of the position it really occupies. After this the country becomes more open, and we left Wadi Shaid, and went by Wadi Abu Murad, and then into Wadi Abu Asaya into a rough uneven plain. After crossing the plain, which is drained



PLAN OF MINED AREA BETWEEN WADI NUGRUS AND WADI SIKAIT.



PLAN OF JEBEL SIKAIT, SHOWING POSITION OF MINES.

by Wadi Hemma, we crossed a steep divide and descended into Wadi Abu Had, near a well. This point is also the junction of the two routes already mentioned. The well is dug through the sands and rotten rock into a firm impervious granitic rock, and when we arrived there the well contained a little water, which, however, was too dirty for a white man to drink.

The main part of the caravan went on to Sikait on December 23, leaving me with two of the Cornishmen and ten natives to deepen the well. This we did until it produced 120 gallons a day, and on December 27 we started for Sikait. From Abu Had to Sikait the journey lies through well-defined wadis in crystalline rocks and schists.

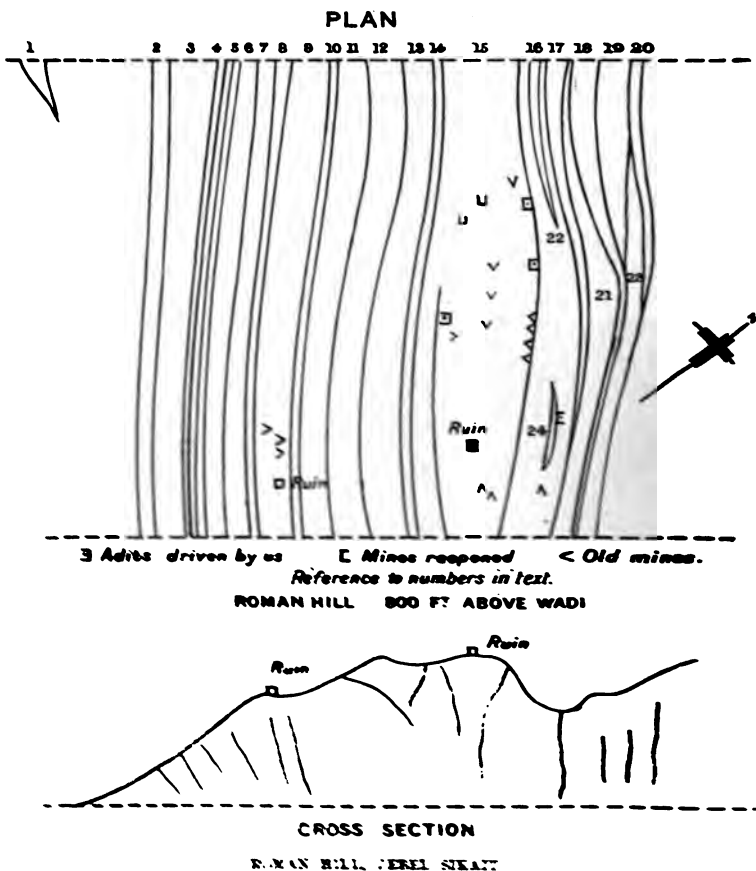


JEBEL SIKAIT FROM THE WEST.

Passing through Wadi Abu Had, we continued through Wadi Hafafit, which in some places has huge drifts of sand blown up to 100 feet high, and then into Wadi Jemal and part of Wadi Nugrus into Wadi Sikait, and arrived at the encampment near the emerald mines at the foot of Jebel Sikait on December 28, 1899. The country as a whole may be described as wild and desolate, and a climb to the top of Jebel Sikait, which is 1800 feet above sea-level, and 1200 feet above the wadi, gives a splendid view of the country. Sikait is 15 miles from the sea as the crow flies, and about 25 miles by way of Wadi Jemal. The district between Jebel Sikait and the sea consists of an expanse of low hills through which small wadis wind in and out. Towards the west the hills are higher, and beyond them is an arid plain. To the north and

south mountains are seen looming out in the distance. The greatest heat experienced by us while in this region was 127° Fahr. in the shade.

The country for miles seems to have been subjected to a regional



1. Grey talc schist.
2. Fragments of impure talc schist.
3. Fine to medium hornblende schist.
4. Bladder hornblende schist with quartz.
5. Talc.
6. Crystalline tough hornblende schist.
7. Same but finer.
8. Impure talc schist.
9. Right quartz mica schist.
10. Impure grey talc.
11. Very quartz hornblende schist.
12. Fine grained tough crystalline rock.

13. Green talcose rocks.
14. Quartz rock.
15. Very tough quartz mica schist.
16. Mica schist.
17. Talc schist.
18. Mica schist, tough; nodules of brown spar.
19. Tough hornblende schist.
20. Quartz rock.
21. Quartz mica schist rock.
22. Crystalline.
23. Same but tough and coarse.
24. Quartz rock.

metamorphism, and the disturbed condition of the strata and the highly metamorphosed rock is the most notable characteristic. The land has been wrinkled slightly into anticlines and probably lateral pressure has helped least from below in changing the original strata.

Subsequently, and especially round Sikait, the region has been denuded apparently by the disintegrating effects of the sun's heat during the day and the fall of temperature during the night, and the occasional rains, which at one time—judging from the shape and size of the wadis—must have been more plentiful than now. After denuding processes had been at work for some time, Wadi Sikait chose an easier channel for itself, by running between bedrock gneiss on the one side and the schists on the other, and, in fact, a glance at the large-scale map will show how the three wadis, Sikait, Nugrus and Abu Rushaid have in this vicinity all chosen this sort of course. In fact, between the three



VIEW OF WADI FROM JEBEL SIKAIT: SHOWS ENTRANCE TO ONE OF THE MINES, JUST BELOW THE FIGURES.

wadis just mentioned there is an inlier of gneiss, which, however, is as high as the surrounding hills.

The schists of Jebel Sikait have a strike of about N. 60° W., and are inclined at an angle of about 45°, and overlie bed rock gneiss on the one side, while on the other side they are enclosed by tough green sub-translucent serpentine (altered olivine), of which the upper part of the mountain is composed. Talc-schist and mica-schist occur over large areas. Many of these are hydrated, and pass from tough schist to soft powdery rock. The mica-schists vary largely in constitution, some containing very little quartz, while others have the appearance of a finely bedded contorted sandstone. In the mica-schist and talc-schist occurs the beryl, which was the object of search of the peoples of 2000 years

ago, and the extensive workings show how well organized this search was in days gone by. Hornblende, gneiss, schists, and slates occur largely. Tourmaline and schorl, garnet, actinolite, crysolite, etc., are common minerals.

THE MINES.—The mining is of a most primitive character. The ancients simply excavated, in the likely emerald-bearing schist, a network of long and very tortuous passages just large enough to allow of the body being dragged through, and only in a very few cases was any attempt made at stoping (or excavating) the entire seam. It has been suggested that the passages were made small on account of the absence



SMALL SHRINE IN THE HILLS BETWEEN WADI NUGRUS AND WADI SIKAIT, CUT IN THE SOFT ROCK.

of timber, suitable to be hewn into supports, which would be necessary to prevent collapses in the case of larger excavations. So small are the openings, that a casual observer would not notice the existence of a mine at all but for the grey *débris* thrown out at the mouth. Along the schists at Sikait alone we visited considerably over a hundred mines, some of which took more than an hour to crawl through. That these mines have been worked at widely distant periods, is evident from the different styles of work. There are seven or eight groups of mines in different places within a couple of hours or so of Jebel Sikait.

RUINED TOWNS.—Besides scattered ruins, tombs, and watch-towers, there are at least five ruined settlements in the neighbourhood of Jebel Sikait. The attraction which induced the people to live in this barren land was undoubtedly the beryl, which it was known could be obtained by mining here. The variety and finish of the buildings point to the conclusion that these settlements or towns were built at different periods and by various peoples. Beginning with the rudest of these, we find houses of two small rooms built of stones picked up in the



ABBADI NATIVE.

wadis. No attempt was made to square off the corners of these small abodes, and the walls had to be made thick. Some ruins consist simply of a wall little more than two feet high, which served to protect the occupants for the night from cold winds and blowing sands. These primitive houses are generally very close together, and all buildings were placed a little above the bed of the wadi, to escape the floods caused by periodic rains. Other ruins show houses with more pretensions to some sort of design, but still built of carelessly selected stones.

Some of these houses have small spaces for windows, while, curiously enough, small cupboard-like rooms at a higher level than the floor have been constructed apparently for sleeping purposes, as they are too low to stand up in. In other cases the houses have been built by masters of the art. The stones have been selected, the flattest only being taken. These have been trimmed and then well fitted, so as to form a wall perfectly flat with sharp corners. In a small chamber that I saw, I noticed that the roof had been made of slabs of stone about 7 feet



ABBADI NATIVE.

long, laid across from wall to wall. One building stands about 20 feet above the wadi, and is reached by a stone stairway from either side leading up from the wadi bed. There is a great deal of broken pottery, some ornamental, but for the most part perfectly plain.

ROCK TEMPLES.—In Wadi Sikait there are three rock-temples. The rock in which the temples are cut is an easily cut impure talc schist. The temple which is in the best condition consists of a chamber about 20 feet square, opening directly on the wadi. Steps lead up to this

chamber from the wadi. During the excavation of the interior, columns of rock were left, and afterwards rudely shaped. Mr. John Belcher, A.R.A., to whom I have shown my rough sketches, is of opinion that the pillars are Egyptian, showing signs of Greek influence, but that the work is very primitive. At the inner end of the chamber is a recess raised about 2 feet from the lower floor, approached by steps, and divided into three compartments. Each division contains an altar. On each side of the temple are low chambers about 4 feet high. The walls of the temple bear faint traces of painting. Over the entrance of another temple there is a Greek inscription, too much obliterated for me to make a useful copy. The third is high up and in a very much ruined condition. While exploring the mines between Wadi Nugrus and Wadi Sikait, we found a niche cut in the talc schist, and containing a carving in high relief representing the head and shoulders of a man.

HIEROGLYPHICS—ROCK SCRATCHINGS.—At the junction of Wadi Mueila and Wadi Shaid there are a great many drawings of figures, tribal marks, and animals in the form of scratchings on the rock. I sent a drawing of a patch of hieroglyphics to the authorities at the British Museum, who say they are probably the names of travellers who had passed that way, with pious ejaculation for having reached so far on their journey. The scratchings, some of which are very old, depict family scenes and tribal markings, and also ibex, gazelles, ostriches, goats, horses, dogs, camels, dromedaries, and oxen. Fights are sketched in which the combatants use swords and spears, and the bow and arrow.

NATIVES.—In some few favourable spots small encampments of natives are found, but it is certain that these people cannot live without having to pay periodic visits to the Nile to trade their goats, sheep, and charcoal for corn. In this locality they claim to be descendants of Abbad, a prophet, and they are, as a whole, physically inferior to the Arabs of the Nile valley. Their faces are spare, and sometimes almost delicate, with thin lips and straight or aquiline noses, but there are coarser types. They are darker than the Arabs of the Nile. The hair is dressed after the manner of the Bischareen—a fuzzy head of hair on top, with ringlets twisted like rope hanging all round as far as the shoulder. The cleaner of them shave. They are small people, and extremely lazy and incompetent, and they cannot even perform their own duties in a workmanlike way. Their favourite proverb is, "Starve on a penny rather than work for a pound." They are corrupt and dishonest even among themselves, and it is seldom that intelligible information can be obtained from them.

WATER.—There is a fine galt, or reservoir, in a small tributary off Wadi Nugrus, near the ruins. It is five hours distant from Jebel Sikait; the exact position I have indicated on the map. It is in porphyritic gneiss, and contains enough water to last a party of twenty

for the season. Another rock pool, also shown on the map, is up a small tributary (wadi) off Wadi Sikait, and it supplies sweet water for a short time from a fissure in the rock.

FAUNA.—Gazelles* are numerous, but the want of water keeps down the number of ibex, as these never wander very far from reservoirs. Foxes, conies, rats, and mice occur plentifully. There are a few hares. Hyænas are said to be numerous round Jebel Mijif. Lizards and snakes are plentiful, and insects of all kinds. I brought back a collection of insects, lizards, and other animals, which I have given to the Natural History Museum, and Mr. Charles O. Waterhouse of that institution, has kindly furnished me with the following list of the most rare or interesting specimens:—

Mammals: *Aconys dimidiatus* (spiny mouse).

Gerbillus calurus (tuft-tailed gerbille; rare).

Snakes: *Psammophis schokari*.

Echis ioloratus (new to Egypt).

Lizards: *Ptydactylus lobatus*.

Agama spinosa.

Eremias Guttulata.

Insects: *Stalagmosoma albella* (rosechafer; new to Egypt).

Buprestid.†

JEBEL SIKAIT—CROSS-SECTION.

(See Map, p. 596.)

1. Coarse talc schist with graphite.
2. Hornblende rock.
3. Quartz.
4. Fissile mica schist and tough hornblende schist.
5. (Mined) Mica schist and impure talc schist, beryl.
6. Quartz porphyry (brownish-red crystals).
7. Fissile yellow quartzose mica schist.
8. Talc schist with graphite.
9. Quartzose mica schist.
10. Fissile mica schist, chrysolite and talc schist in pockets
11. (Mined) Quartzose mica schist, beryl.
12. Talc schist with ferruginous calcite nodules.
13. Micaceous hornblende schist.
14. Quartzose mica schist.
15. Coarse mica schist.
16. Schorl and tourmaline rock, actinolite.
17. Schorlaceous schist, fibrous.

* They are very wild and shy: after two days' arduous stalking I was only able to shoot two.

† Since these notes were written, Mr. Waterhouse has communicated an account of this to the *Annals and Magazine of Natural History* (ser. 7, vol. vi., August, 1900), "Description of a New Species of Buprestidæ," which he calls the *Psilopiera MacAlisteri*.

18. Quartz reef.
19. Garnet rock (hornblende and quartz).
20. Quartzose hornblende schist.
21. Quartzose actinolite schist.
22. Fissile hornblende schist.
23. (*Mined*) Quartzose mica schist, beryl.
24. Talc schist with ferruginous calcite nodules.
25. Greissen, rich in quartz.
26. Greissen.
27. Coarse impure talc schist.
28. Quartzose mica schist.
29. (*Mined*) Mica schist, beryl.
30. Talc schist with ferruginous impurities.
31. Argillaceous mica schist.
32. Fine-grained argillaceous mica schist.
33. Hornblende schist.
34. Fine-grained slaty mica schist.
35. Quartzose mica schist.
36. Fine-grained micaceous hornblende schist, poor in hornblende.
37. Jasper.
38. Granite.
39. Amphibolite rock, poor in hornblende.
40. Argillaceous slate with dendrites.
41. Impure talc schist.
42. Schistose amphibolite rock, poor in hornblende.
43. Light spotted apple-green serpentine, chrysolite, nephrite, and metamorphosed siliceous limestone.
44. Subtranslucent green serpentine, olivine, and nests of talc schist which contain soluble salts, stockworks of actinolite.

THE DUTCH "SIBOGA" EXPEDITION TO THE MALAY ARCHIPELAGO.

THE scientific material brought home by the staff of the Dutch exploring vessel *Siboga* from the Malay archipelago is so extensive that a considerable time must elapse before the results of the cruise, connected as they are with so many separate branches of science, can be thoroughly understood. The material will, of course, be worked up by specialists, and eventually published in a series of volumes, at least fifteen of which, of quarto size, will, it is thought, be required to embrace the whole. Meanwhile the broad outlines of the work accomplished have already been sketched by Prof. Weber, the leader of the expedition, and a comprehensive summary of the results has been contributed by him to the eighth number of *Petermanns Mitteilungen*, from which some of the most important conclusions, together with the sketch-map showing the track of the ship, are here reproduced.

Although the main motive of the expedition was the prosecution of zoological research in the deep waters of the archipelago; results of great value from a geographical point of view have, as already mentioned in the *Journal*, been obtained. Especially important is the knowledge gained of the various deep basins of the archipelago and their mutual connections. Although occurring in the midst of a labyrinth of land masses, these basins attain a surprising depth, the Banda, Celebes,

Savu, and Ceram seas all considerably exceeding 2000 fathoms, while the deepest parts of all reach a depth of 3000 fathoms. It is only in their upper layers that these various seas communicate with the neighbouring oceans, the deeper basins being everywhere enclosed by submarine ridges, above which the sea has nowhere a greater depth than 900 fathoms. East of the Java sea, itself comparatively shallow, the first deep basin is formed by the Bali and Flores seas, occupying a narrow furrow connected further east with the Banda sea. The connection is proved by the fact that on a line between eastern Flores and Saleyer, depths of



BATHYMETRIC CHART OF THE MALAY ARCHIPELAGO.

1400 fathoms were found. The Savu sea, between Flores and Timor, was found to be cut off from the deep water of the Indian ocean by a ridge, on which the greatest depth was 796 fathoms. Its cold bottom water must therefore be derived from the Banda sea, the connection being supplied by the Ombai passage.

Coming next to the Banda sea, the water of which, below 875 fathoms, has a uniform temperature of $37^{\circ}4$ Fahr., we find that this likewise is cut off from the Indian ocean, east of Timor, by shallow water. On the north the facts are somewhat different. The cold water of the Pacific has free access by the Molucca

passage as far as a ridge between the Zulla islands and Great Obi, and even this allows the passage of water of the critical temperature of $37^{\circ}4$ Fahr. (3° C.), which is again that of the lower strata of the Ceram sea. The connection of this latter with the Banda sea has been found to take place, not through the Manipa strait, as had been supposed, but between Buru and Zulla Besi, where unexpectedly great depths were encountered, the supposed results of former soundings proving quite erroneous. The Banda sea does not form a single basin, but is divided by a ridge running from Lucipara to Banda. The greatest depth found was 3108 fathoms.

The last deep basin of the archipelago is the Celebes sea, which is independent of those already mentioned. The lowest temperature of its water is $38^{\circ}7$ Fahr., a fact which seemed to indicate that it is cut off from the Pacific by a shallowing of the sea to 710 fathoms, at which depth the given temperature is first reached. Soundings taken in the passage between the Karkaralong group and Sarangi, south of Mindanao, revealed, however, no depth less than 899 fathoms, while still greater depths were found between Sangi and the Talaut group. Further soundings will therefore be necessary before the question is settled.

The results obtained by soundings in the Strait of Lombok were also of importance. The discovery of a submarine ridge, with a maximum depth of water above it of only 170 fathoms, proved the falsity of the old idea that a continuous deep channel ran through the strait. Prof. Weber's zoological investigations have also shown that Wallace's well-known line of partition between the Indo-Malayan and Australian faunal regions is of less importance than had been supposed. In his opinion the separation between Bali and Lombok may be of quite recent date, while the discovery, for the first time, of a Cyprinoid east of the strait, also tends to modify the old idea.

The investigation of the composition of the sea-bottom brought out some interesting facts. Pelagic deposits—using Sir J. Murray's nomenclature—are naturally little represented, as compared with those classed as terrigenous, which are derived from the land. The mud of the deep basins was usually coffee-coloured in its upper layers, and a bluish or greenish grey in the more compact layers below. In the Banda sea these become whitish. The floor of the same sea is characterized, especially at a depth of 1500 fathoms, by the abundance of a rhizopod (*Rhizammina algoformis*), which, with allied forms, apparently constitutes so thick a layer as to allow of tall-stemmed Bryozoa rooting in it. The remains of land plants are also abundant everywhere. Prof. Weber attributes the importance of the terrigenous deposits to the influence of the rivers, which, owing to the high rainfall, and the friable nature of the volcanic rocks over which they flow, carry down an immense quantity of solid matter into the sea. Currents also play an important part in the transport of such material, and the observations went to prove the great depth to which their action extends. This is shown particularly by the "hard ground," with absolutely no covering of mud, which is generally found in the channels where tidal and other currents are especially active. Such ground possesses quite a different fauna to that of the usual mud deposits, certain kinds of siliceous sponges (*Hexactinellida*) finding it, apparently, a particularly congenial home.

Considerable attention was paid to the coral formations of the archipelago, and Dr. Weber considers it established by his researches that, except in a few isolated cases, no atolls exist in that region. The only exceptions known to him are Gisser, near Ceram, and Dana, in the south of the Savu group, with the possible addition of the Muaras reef, in the west of the Celebes sea. An examination of the islands of the Borneo bank, some of which have been supposed to be atolls, convinced him that such is not the case. This group of islands is, however, of special interest

from the facilities which it gives for the study of the development of plant-life on such islets, all stages being seen from the bare heap of coral sand to the island clad in tall forest. Another result of the expedition was the disproof of the supposed absence of coral reefs in the area north of Java and Sumbawa, the Paternoster and Postillon islands showing, amongst other groups, an unusual development of coral formation. The discovery of calcareous algæ of the genus *Lithothamnion* in such quantities as to form submarine banks is also of much interest, especially from the fact that such banks were found in close association with coral reefs.

Lastly, the Siboga expedition may be expected to throw valuable light on many questions connected with the distribution of the marine fauna, and especially on the relation of the fauna of the enclosed basins to that of the open ocean. Prof. Weber's researches tend to show that the partial isolation of these basins by submarine banks has had less effect in differentiating the fauna than has been sometimes supposed, the slight differences of temperature which come into play being insufficient to form a barrier to migration. Nor do differences of pressure at different depths appear to prevent the migration, in course of time, of deep-water organisms across the shallower areas by which the basins are separated.

THE MONTHLY RECORD.

EUROPE.

Geography of North German River-basins.—In 1892 the Hydrographic Committee of the Prussian Government dealt with the pressing question of the precautions to be taken to avoid the danger of floods in the lower courses of the great rivers which cross the North German plain from the mountains to the sea. In order to bring to a focus the results of existing surveys, topographical, geological, climatological, and technical, the firm of Dietrich Reimer issued in 1896 a work on the basin of the Oder, followed in 1898 and 1899 by the works under notice,* which deal with the Elbe, Vistula, Pregel, and Memel, thus completing the series of large North German rivers. The plan of the series is uniform, and consists of a collection of all available data, official when possible, relating to the configuration of the river-basin, its geology, climate, especially rainfall, the slope, sectional area, and the volume of the rivers at different seasons. These data are given in tabular form in a special volume, discussed fully with additional matter in the text, and represented graphically in a series of admirable maps and sections. The whole forms a complete basis for the regional geography of North Germany and the neighbouring parts of Bohemia and Poland; while from the technical point of view it is an encyclopædia of accurate information relating to all questions regarding the utilization and regulation of the rivers in question. It is not a mere excerpt from official reports, for these reports are necessarily bounded by political divisions, while the special value of this work is that all the data are brought together and recast, so as to apply to physical regions even where these are shared by two or more separate countries. The orographical and rainfall maps of the Elbe basin are peculiarly interesting in this respect, showing how the steep slopes and relatively great area of the high lands which form the basin of the upper river are subject to

* Der Elbstrom; sein Stromgebiet und seine wichtigsten Nebenflüsse. 5 vols. and Atlas. 1898. Memel-, Pregel-, und Weichselstrom; ihre Stromgebiete und ihre wichtigsten Nebenflüsse im Auftrage des preussischen Wasser Ausschusses herausgegeben von H. Keller. 5 vols. and Atlas. 1899. Berlin: Verlag von Dietrich Reimer (Ernst Vohsen).

heavy rainfall, and thus likely to give rise to serious floods on the low though much less rainy plain across which the lower course of the river meanders. In connection with the question of rainfall and run-off, much attention is given to the distribution of woodlands, and the forest maps which accompany the work show how much of North Germany still remains under trees. The object of the series is strictly practical, but the object is attained not merely by the accumulation of tables of statistics, but by the treatment of these statistics, so as to bring out general relationships and show what natural conditions are responsible for the variable phenomena which make great rivers a source of advantage and anxiety to the inhabitants on their banks. The books are admirably produced, although lacking photographs, which might have added something to their value. The maps are beyond praise alike for clearness and accuracy.

German and Czech in North-West Bohemia.—A careful study of the present position of affairs on the frontier between the Germans and Czechs in western and northern Bohemia is being contributed by Dr. J. Zemmrich to *Globus*, in which periodical two articles, dealing together with the line of country from Bischofteinitz to Lobositz, have already appeared (vol. 77, No. 1; 78, No. 7). The author traces the various influences—clerical, industrial, educational, etc.—at present at work for the extension of one or the other population along various parts of the frontier, where the struggle for supremacy is being carried on with unabated vehemence, the individual communes being often the scene of embittered contests between the two races. On the whole, the Czechs, who can command superior pecuniary resources, and throw themselves with the greatest fervour into the contest, appear to be gaining ground, though from special causes the German element shows an advance in certain districts. The maps which accompany the papers show that in those parts where such mixture has taken place that no definite boundary between pure German and pure Czech (i.e. over ninety per cent. of the respective races) can be drawn, it is, as a rule, the Czechs who have of late advanced their outposts into the German sphere (the Germanization of which dates back some two hundred years), rather than the reverse. Although they have fallen back somewhat in the tongue of land which projected into German ground north of Stankau, and in the former Czech enclave of Mies, they have gained much ground in Pilsen, and in the industrial region around Nürschan, west of that town. Fifty years ago only some three or four thousand, out of a total population of fourteen thousand in Pilsen, were Czech; but the influx of population which has since taken place has been almost entirely Czech, and in 1890 the proportion of Germans only amounted to 16·2 per cent. Nürschan, the chief centre of the coalfields of Western Bohemia, already shows a Czech majority, and if the process now going on is continued, the Czech population will probably in time join hands with that in the Mies enclave. Further to the north-east a similar state of things is reported, though the linguistic frontier is, in parts, more sharply defined than further south. In the coalfields of Britz and Dux, the Czech element has largely increased on the German side of the normal frontier, owing to the influx of Czech miners. In Trebnitz, again, the Czech language has gained a firm footing, although the town passed not long ago as entirely German. In the neighbouring town of Lobositz, however, which occupies an important position at the junction of six lines of railway, the prospects, from the German point of view, are said to be much brighter.

Austria-Hungary and the Eastern Trade.—This subject is dealt with by Dr. Wilhelm Schwaighofer in the fourth part of the *Statistischen Monatschrift* of Vienna for the present year. The East, the writer remarks, is, from the point of view both of geographical position and historic development, a natural commercial

dependency of Austria-Hungary. Until the middle of the third decade of the nineteenth century Trieste did, in fact, almost monopolize the trade with the Levant, although the amount was not large, hardly exceeding £700,000 at the beginning of the century. A great change set in with the rise of British and French shipping intercourse with the East and the liberation of Greece. The region north of the Balkans remained for a time a preserve of the monarchy, but here, too, British and French, and even German competition made itself felt, so soon as the railway development of the seventies and eighties began to open up the Balkan peninsula from the side of the sea; the falling off of Austrian trade being attributable to the high protective tariffs of the lesser Balkan States, and to the greater cost of production, higher freights, and relatively small inclination to business shown by the people of that monarchy. The last decade of the nineteenth century has seen a considerable improvement, as the following statements show. The trade of Austria-Hungary with the Levant has followed the same course as the total commercial movements of that region, reaching a high level in 1891, falling in 1895 and rising in 1898. The increase in the latter year has not, however, been equally divided between the six great powers which principally shared in it, for whereas the export trade of Great Britain, Germany, France, and Russia to the East has declined since 1891, that of Austria-Hungary has risen from 19·2 to 25·6 per cent. of the whole, and that of Italy from 3·3 to 7 per cent. Great Britain still stands at the head in this respect, Austria-Hungary coming second, and Germany third. The Eastern export trade is of more importance to Austria than to any other state, amounting in 1898 to 11 per cent. of her total exports, while as in the case of Russia, but not of the other four states, it exceeds the import-trade in Eastern productions. Since 1891 it has risen from £5,600,000 to £7,400,000, chiefly as a result of the increased exports to Greece, Turkey and Rumania; those to the farther east (Asia, East Africa, and Australia) rising from 1 to 2½ millions. Imports from the east have risen during the same period from 3·8 to nearly 7 millions. Nine-tenths of the exports to the East consisted of industrial products, this being especially the case with those to Egypt and British India. The following statements show the share possessed by Austria-Hungary in the import trade of neighbouring states. In Greece, where Great Britain and Russia run a close race for the first place, France comes third and Austria only fourth. In Rumania, on the other hand, Germany is the only serious rival of the latter, the British share (of imports, not of exports) having fallen off greatly of late. In Serbia and Bulgaria the monarchy still holds the first place, though with a reduced lead, Great Britain and Germany following next in each case. In Turkey, Austria-Hungary comes second with a large increase of late years, Great Britain being first, and France third. As regards the articles of import into Eastern countries, Great Britain is the chief rival of Austria-Hungary in the matter of cotton and iron goods, and machinery; France for leather goods, silk, sugar, paper, and wearing apparel; Russia for sugar and spirits. Quite recently Italy has come forward as a competitor for trade in cotton, silk, and paper, but the most all-round competition for the export trade to the near East is experienced from the side of Germany. For the lower Danube states, railways and river-steamers form the principal means of transport, but in the case of Turkey and Greece, goods go chiefly, and in an increasing degree, by sea. A large part of Austrian trade with the far East passes through foreign (principally German) ports, owing to the smallness of the Austrian mercantile marine. By far the most important port for the Eastern trade is Trieste, which, out of a total trade of 16½ million pounds, had dealings with the East in 1898 to the extent of 9½ millions.

Waterway from the Baltic to the Black Sea.—Some interesting information respecting the various projects which have been started for improving the water

communication between the Baltic and the Black sea, and the principal physical difficulties to be encountered in their execution, has lately been published as a Foreign Office Report (Misc. Ser., No. 529). It is supplied by Mr. Consul Woodhouse, who begins by recapitulating the schemes which have been set on foot from about 1840 onwards, all of which have fallen through without leading to any practical result. The question was examined in detail by a committee of experts at Riga in 1875 and 1876, and the surveys executed then and later have formed the basis of subsequent proposals, the latest of which is one made quite recently by a syndicate of British capitalists, who propose to provide a channel from sea to sea, of a minimum depth of 28 feet. This scheme in its present form is regarded in Russia as quite impracticable, though it is recognized that with a much smaller depth, valuable facilities would be given both for the transport of commerce from the interior, and for the supply to the northern industries of coal, iron, and other articles from the southern provinces. The proposed route is by the Duna to the Dneiper by the channels of the Ulla and Berezina. From Riga to Ulla, a distance of 311 miles, the Duna is full of sandbanks and rocky shallows, the average depth being less than a fathom, while the total fall is about 320 feet. On the Ulla again there are stony shallows, and from Lake Plavio, where the highest water-level on the route occurs, there is a fall of 124 feet to Chashniki, on the Ulla, and of 21 feet to Salassi, on the Berezina, twelve locks occurring during the whole interval. The Berezina, which falls into the Dneiper at Gorval, is shallow throughout, and only serviceable for small vessels. On the Dneiper, the greatest obstruction is caused by the cataracts below Ekaterinoslav, caused by a granite outshoot of the Carpathians, which limit the trade to rafts of timber and raw and other produce floated down in lightly constructed barges. The whole distance by this route from sea to sea is about 1410 miles, while by an alternative route, connecting the Duna with the Dneiper, *via* the Lucheza, the distance would be about 1498 miles. Mr. Woodhouse points out the great difficulties in the way of a canal 28 feet in depth, but considers that one of 4 or 5 feet would involve a comparatively small cost, and would undoubtedly be of great service.

ASIA.

The Dead Sea.—In the *Quarterly Statement* of the Palestine Exploration Fund for July, 1900, Mr. Gray Hill, who resides within sight of the Dead sea, and knows its neighbourhood well, points out that its surface has risen considerably of late years. After quoting a statement of Mr. Tyrwhitt Drake made in 1874, that the bottom of the lake was then subsiding, he says that this could only apply to isolated spots, while the circumstances mentioned are quite consistent with a rising of the surface of the water, and, indeed, point to it. Mr. Hill mentions several facts which prove that the level has risen of late years, at any rate. The Rujn el-Bahr, which existed as an island a few years ago, near the north end of the lake, has now disappeared. Near the Jordan mouth, too, there is now a large lagoon lying to the north of the north beach, and it is evident that the sea has invaded the old mouth of the river and submerged much of the land in that neighbourhood. Near the south end, Mr. Hill passed in 1890 between Jebel Usdum and the sea, there being a few yards of dry land in front of the mountain; but on two occasions since 1894 he has been taken through a passage in the chalk cliffs behind the hills, being assured that the water was up to Jebel Usdum. On the east, again, the beach shown in the Exploration Fund map as extending along the whole shore does not exist, water of considerable depth coming close up to the cliffs and rocks, as Mr. Hill found during a boat voyage along this shore in 1897. The water does not appear to fall during the summer, and the rise cannot be due to the rainfall at

any particular season, though a generally increased rainfall of late years might be a possible explanation. Mr. Hill suggests that volcanic action is at work raising the bed of the lake, and mentions, in connection with earthquake phenomena, some remarkable flashes of light observed by him in May, 1899, coming from a hollow in the mountains just north of Mojib, and possibly due to the ignition of naphtha or petroleum. A graphic account is given of the voyage above alluded to, which was undertaken in search of a drawing and inscription said to exist just south of the Wadi Mojib. The spot was reached by boat from the mouth of the Jordan, but the supposed inscription proved a freak of imagination, while it was only with the greatest difficulty that the return voyage was made in the teeth of an adverse wind. This part of the lake seemed quite inaccessible from the land side. It is difficult to reconcile with Mr. Hill's statements the report alluded to in the February number of the *Journal* (vol. xv. p. 175), that the Dead sea is rapidly drying up.

Dr. Schaffer's Expedition to Asia Minor.—An Austrian geologist, Dr. Franz Schaffer, has, during the present year, investigated the geology of the mountain districts of South-East Asia Minor. Although somewhat hindered in his mountain excursions by snow, he was able, before the end of May, to traverse the Anti-Taurus as far as Hajin and Feke, and to carry out a thorough examination of the Bulghar Dagb, the main chain of the Taurus, up to the then position of the snow-line. He had also done some exploring work in Cilicia Trachaea, discovering many hitherto unknown ruins, including a rock-cut necropolis and station of early Christian times. An ancient road was also traced for a considerable distance. Dr. Schaffer has returned to Cilicia during the present autumn to continue his examination of the higher parts of the Taurus, as well as of the Giaur Dagb and the border region on the side of Syria. In the spring he discovered apparent traces of former glaciation, and hoped to obtain further results when the mountains were freer from snow. Dr. Schaffer is travelling on behalf of the Vienna society "Zur Förderung der Naturhistorischen Erforschung des Orients," and extracts from some of his letters, addressed to that body, are printed in the *Mitteilungen* of the Vienna Geographical Society (1900, Nos. 3 and 4).

The Murder of Mr. Rijnhart in Tibet.—A note in the *Deutsche Rundschau* (No. 11, 1900) states that further details have at last been received respecting the murder of the Dutch missionary, Mr. Rijnhart, in Tibet (cf. *Journal*, vol. xiv. p. 205). A lama of the celebrated monastery of Kumbum, who had been on friendly terms with Mr. Rijnhart, is said to have followed the latter's traces with a view to clearing up the mystery of his fate, and, on arriving at the place where he was last seen, to have obtained intelligence which left no doubt that he had been murdered. The governor of Sining is stated to have sent a party to apprehend the murderers, but with what result has not yet transpired.

Geographical Work of the French Jesuits in China.—The recent contributions to our geographical knowledge of China, made by the members of the French Jesuit Mission in the provinces of Ngan-hwei and Pe-chi-li, are summarized by M. Fauvel in the August number of *La Géographie*. The work of the fathers which is most generally known is that carried on at the meteorological observatory at Zi-ka-wei, a village in the vicinity of Shang-hai; but other more strictly geographical results have been obtained from their labours. The chart of the Yang-tse in sixty-four sheets, based on the surveys of Père Chevalier, has already been referred to in the *Journal* (vol. xiv. p. 316; xv. p. 678). The determination of positions by Père Chevalier rests on no fewer than 800 astronomical observations carried out at 48 separate stations. Maps of parts of Ngan-hwei and Pe-chi-li have also been prepared from the material collected between 1870 and

1890 by the late Père Pfister, but they have not yet been issued to the public. Various memoirs of geographical interest have been published in the collection entitled *Variétés sinologiques*, including a historical and geographical study of the province of Ngan-hwei, by Père Havret, who has also compiled a map of the province. Another memoir deserving mention is that of Père Gandar, entitled *Le Canal Impérial*, which shows, by the help of maps, the state of the canal under the different dynasties and at the present day. Altogether the work of the fathers seems a worthy continuation of that of their predecessors in the eighteenth century.

AFRICA.

M. Foureau's Route round Lake Chad.—M. Foureau, who on his arrival in France early in September received a warm welcome from the Paris Geographical Society, has presented to that body a sketch of his route from Zinder round the north and west of Lake Chad to the Shari and its tributary the Gribingi. The sketch, which with an accompanying note is published in the September number of *La Géographie*, is only provisional, but is of interest pending the working up of the result of M. Foureau's observations. Having reached the Komadugu Yobe, M. Foureau visited the ruins of Kuka, and then retraced his steps towards the north, following, on the whole, the shores of the lake. The outline of the latter will apparently be considerably modified as compared with its present delineation on our maps, which has been, it is true, extremely vague. Villages are placed in many spots usually shown as occupied by water, but which would therefore seem to be dry land even when the lake-water is at its highest. This is especially the case near the centre of the north-eastern shore, where M. Foureau's route reached a point some 35 miles within the supposed shore-line. We are pleased to state that M. Foureau has promised us a paper summarizing the geographical results of his journey.

Gold-mining in Egypt.—It has long been known that in very ancient times gold-mining was carried on to a considerable extent in the mountainous districts between the Nile and the Red sea, though little definite information on the subject has been available, few travellers having visited the ancient mining districts within recent years. Attention has, however, been lately attracted to the subject, and a company has been formed in London, with exclusive rights of search for minerals for a term of years, for the purpose of examining the possibilities of a renewal of the industry. An exploring expedition, sent out in the winter of 1899–1900, under the leadership of Mr. Charles J. Alford, examined the country between 23° and 27° N. lat., searching for the ancient mining sites, and studying the geological formations represented. Mr. Alford's report, issued in March last, contains a good deal of information regarding the general geography of the districts visited, some of which were previously almost unknown ground. Attention was first directed to the northern portion of the company's concession, a start being made from Kenh, and the mountains explored between 26° and 27° N. lat. Subsequently an expedition was undertaken to the east of Assuan, during which the old workings between 23° and the latitude of Luxor were examined. From Assuan to Um Eleagha, near Berenice, the route coincided with that of Mr. E. A. Floyer in 1891, but from the latter point northwards it lay through a country previously unexplored. The mountain districts throughout the sphere of operations are formed of crystalline rocks, principally granite, but passing in places into gneiss and mica schist, traversed by dykes and intrusions of greenstone, felsite, porphyry, etc. It is in these rocks that most of the auriferous quartz veins occur. This central core is flanked on either hand by conglomerate, Nubian sandstone, crystalline limestone, and tertiary limestone, in the order indicated. The most striking physical features

are the dry watercourses or wadies, which in their lower courses form, except during heavy rain, hard sandy roads, winding between cliffs of rock sometimes 200 feet in height. The ancient mining sites, of which twelve were discovered within the concession, are marked by irregular groupings of small huts, sometimes circular and sometimes square or oblong, built of rough unhewn stones. At times they are grouped together and form a considerable town, with an outside wall, large enough to accommodate a thousand men or more; at others they are scattered along the sides of the wadi near the mine workings. The latter were in all cases found to have been from the outcrops of the veins, but the only vestiges of appliances to be seen were the old quartz mills and rubbing-stones, of which many specimens remain. The quartz veins in all the ancient mines were found to carry gold, giving results up to 19 dwts. per ton. The scarcity of water has been thought a great obstacle to mining operations, but Mr. Alford thinks that this may be overcome by opening the ancient wells. Timber and fuel, however, would have to be imported. The report also deals with the reported existence of coal near Rhodesia, opposite Edfu on the Nile, about which nothing definite can yet be stated. Borings, to a maximum depth of 500 feet, are recommended as the simplest way to test the matter.

Count Leontieff's Journey South of Abyssinia.—The August number of *La Géographie* contains an account of the journey of Count Leontieff in the regions south of Abyssinia, which was carried out in part by new routes, and has made some additions to our knowledge of the mountainous country east of the Omo. The journey was commenced in June, 1899, and its first part led parallel to and west of the chain of lakes followed by Captain Wellby, the route coinciding in part with that traveller's. The lakes, none of which were actually visited, are vaguely shown on the map which accompanies the paper, and east of Walamo a lake of the same name is shown as independent of Abai or Pagade, the northern part of which it would appear to represent. Beyond Walamo, after traversing the desert of Zala, Count Leontieff struck west towards the Omo, but again took a more southerly course before reaching the river. After passing through the district of Uba, the expedition ascended to the high plateau of Bako, at an altitude of 5000 feet, where, however, palms were still seen. The town of Bako, in which Abyssinian influence has been established, is said to be large, and the reception hall of the chief is capable of holding over one thousand men. The place forms a natural fortress, and commands a wide view on all sides, the shimmer of Lake Rudolf being distinguishable in clear weather. The type of the people is quite distinct from that of the more northern tribes. The huts, built of bamboo, are pointed, and bows and arrows were seen here for the first time. The lower Omo was reached by the valley of its tributary the Neri, whose course was explored by Dr. Donaldson Smith. The name Nianam, which has been assigned to the former stream, is said to mean simply "river," the names in use by the natives being Bezi, Gagi, and Lehe. It is described as an imposing stream, and the country on its banks as exceedingly rich. The western shore of Lake Rudolf was subsequently followed by M. Chedevre and Dr. Kahn, members of the expedition, as far as the Turkwell. Count Leontieff claims as a new discovery, that of the peninsula cutting off the bay at the north-west end of the lake; but this is an error, as it was already shown in Mr. Cavendish's map. Little seems to have been added to the information already collected by that traveller, Captain Böttge, and Major Austin, with whose accounts Dr. Kahn's statements agree. The latter, like Major Austin, doubts whether the waters of the Turkwell ever reach the lake. The countries bordering Rudolf on this side were found to be thickly peopled.

The Daily Telegraph Expedition in Central Africa.—Mr. Dècle has sent

us, through the proprietors of the *Daily Telegraph*, a further account of his expedition through Central Africa from south to north, bringing down the narrative to June 14, at which date he was in Uyogoma, German East Africa, *en route* for Uganda from Lake Tanganyika. Between the lake and Uyogoma Mr. Dècle had in part traversed new ground, having crossed Urundi at right angles to the routes of his predecessors, and in so doing defined the southern limit of the Nile basin in this region, as well as the upper course of the Ruvuvu, its chief drainage channel towards the Kagera. Unlike the most southern streams of the Nile basin seen by Mr. Dècle north of Tabora on his former journey, the various branches of the Ruvuvu flow all the year round, and some of them carry a considerable volume of water. Mr. Dècle assumes with Baumann that the Ruvuvu is the principal branch of the Kagera, not having, like Dr. Kandt (see below) and other German travellers, visited the point of junction of the two main branches of the latter river. The southern Nile watershed is here formed by a range of mountains running from west to east for about 60 miles, at right angles to the range which borders Tanganyika. At the angle of junction of the two stands Mount Msimanga, some 5500 feet above the lake (about 8200 feet above the sea), while the lowest pass leading from the lake to the Nile basin is 4246 feet above the lake. The ascent from the west is very steep, the last-named altitude being reached in about 12 miles from the lake-shore. The valleys by which the mountainous plateau to the east is intersected have an average altitude of 2500 feet above Tanganyika. Mr. Dècle shows the upper Ruvuvu considerably to the south of its course as sketched by Baumann, who only visited the sources of one or two of its feeders. It appears to make a loop to the north, returning south to join the Luvironza, before which it has a breadth of 60 yards, and is deep with a current of 7 miles an hour. The whole plateau is covered with short grass, and is almost entirely denuded of trees, so that firewood is very scarce. The villages are numerous, but scattered, consisting of a few huts built in the middle of a banana plantation, around which are fields of red millet, cassava, sweet potatoes, and beans. The huts are of the beehive shape. The Warundi use no cotton goods, but are clothed with goatskins or bark-cloth. Each man carries a long spear (7 to 9 feet) with a very small head. Mr. Dècle considers that the route through Urundi would be decidedly inadvisable for the building of a railway. That by the Rusizi would probably present more difficulties still, but one from Ujiji to the Malagarazi and up the valley of the latter would be much easier. Mr. Dècle also sends an abstract of meteorological observations, taken with great care by his assistant, Mr. G. F. Powell, with instruments lent by the Royal Geographical Society. In May and June, 1900, the mean of observations taken on twenty-three occasions on the Urundi plateau (average elevation 5250 feet) showed a maximum temperature of 82·3° Fahr., and a minimum of 54°·8. The absolute maximum observed was 94° (below 4500 feet), and the minimum 52° (above 6500 feet). As in the more southern regions traversed, the rainy season in Urundi has, during the present year, been of unusual duration and intensity, the rains beginning in October and still continuing in June.

Dr. Kandt's Explorations in Ruanda.—A connected account has at last been received of Dr. Kandt's important journeys of exploration, carried on with few intermissions since October, 1897. The narrative, published in the third number of the *Mitteilungen aus den Deutschen Schutzgebieten* for the current year, deals with three distinct expeditions, concerning the second, and perhaps the most interesting, of which, hardly any details had previously been forthcoming. The first of the three, which lasted from October, 1897, to January, 1898, was devoted to the exploration of the Ugalla-Sirdi branch of the Malagarazi, which Dr. Kandt

found to flow in a winding course between banks clothed with the most luxuriant vegetation, but entirely uninhabited. At the end of January, 1898, Dr. Kandt set out from Tabora on a more important expedition, with the object of finally settling the question of the source of the Kagera, or Alexandra Nile. Passing through some of the best cultivated and most populous districts of Unyanwezi, he reached Ushirombo, and thence proceeded through Uyogoma and Western Usui, to the junction of the Ruvuvu with the Kagera. A careful measurement of the volume of the two streams showed that the Kagera was decidedly the more important, and Dr. Kandt decided to follow its course upwards, first, however, paying a visit to the court of the Kigeri, or king of Ruanda. He is of opinion that the individual who passed for the Kigeri on his own visit and on that of other travellers is not the real sovereign, but that the latter, as in many other of the kingdoms of this part of Africa, is kept in the background for superstitious reasons. Dr. Kandt's reception on the part of the Watussi was by no means cordial, though the Wahutu showed themselves friendly. Following up the Kagera by all its bands, the traveller reached the confluence of the Akanyaru and Nyavarongo, and chose the latter for further exploration, as it proved much the more important of the two.* After ascending it for six days, he reached the mouth of the Mkunga, its largest tributary. This takes its rise in the neighbourhood of the eastern Kirunga, formerly known as Ufumbiro, whence streams flow also by the Ruchuru to Lake Albert Edward. Here Dr. Kandt left the Nyavarongo for a time, and made the circuit of Kirunga, which had been reached two months previously by Captain Bethe (*Journal*, vol. xiii. p. 534). Dr. Kandt says that the name Ufumbiro is never applied to the mountain. It is the designation of a district to the north containing a group of low extinct volcanoes, with many hundreds of peaks and craters. Passing south by a vast lava-field along the foot of the twin-peaked, snow-clad Sabyin, in the forests of which he came upon a section of the Watwa dwarfs, Dr. Kandt reached Kivu, and thence struck south-east, ascending the eastern wall of the rift-valley, and gaining the Nyavarongo, where it bore the character of a mountain stream, flowing through the most delightful valleys, the enjoyment of which was only marred by the bands of robbers by which the country was infested. Higher up the Nyavarongo is formed by the junction of the Mhogo and Rukarara. The latter was taken to be the more important, and Dr. Kandt traced it to its source, gradually approaching the edge of the rift-valley, through a difficult but charming mountainous country, quite uninhabited, but visited by honey-seekers on account of the abundance of its bees. Here, at an altitude of about 7000 feet, the thermometer fell below freezing-point, for the first and last time in Dr. Kandt's African experience. After reaching with much difficulty the source of the Mhogo also, Dr. Kandt made his way to the north end of Tanganyika, whence, after a halt of some time, he set out on the expedition to Kivu, about which we have already given some details (*Journal*, vol. xv. p. 178). In discussing the value, for future colonization, of the regions traversed, Dr. Kandt lays stress on the bracing climate of the mountain districts of Urundi and Ruanda, which, he thinks, compensates for the fact that malaria is not entirely absent. The most favoured parts of all lie on the two versants of the range bordering the rift-valley, which impresses the traveller by its luxuriant wooded slopes and abundant springs. At the time of writing Dr. Kandt was meditating a new expedition, in which he hoped to thoroughly survey the Akanyaru.

* It is somewhat doubtful whether observations made at one time of the year only can be relied on to decide the question of the relative importance of the streams. Captain Ramsay (*Journal*, vol. xi. p. 299) thought the Akanyaru carried the more water, but he was unable to make any measurements.

Ancient Ruins in German East Africa.—Further discoveries of ruins, dating apparently from before the arrival of the Portuguese in East Africa, have lately been made (*Deutsches Kolonialblatt*, 1900, No. 19). Herr Karl Perrot, of the mercantile firm Perrot & Co., of Wiesbaden, whose attention had been directed to reports of still undiscovered ruins in German East Africa so far back as 1892, induced the firm to organize an expedition for their discovery early in the present year. It was placed under the command of Herr Bernhardt Perrot, and left Lindi on July 15 for the bay of Kilwa Kisiwani, which has down to the present remained quite unfrequented by European traders. On the north-west corner of Songa Manara island, and on the side facing the mainland, the ruins of an important Shirazi town were discovered, almost overgrown with vegetation. The appearance of the houses, almost all of which were two-storied and built of hewn stone, in some cases provided with ornamentation, indicated that the town must have been considerably more well-to-do than Kilwa Kisiwani itself. The remains of a ruined mosque, and of a Shirazi palace in a better state of preservation, were also seen, while the existence of cotton bushes run wild proved that this crop must once have been cultivated in the locality. Other ruins having been reported by the natives, Herr Perrot has undertaken a second expedition for their examination.

German Limnological Investigations in Lake Nyasa.—In the sixth number of the *Verhandlungen* of the Berlin Geographical Society for 1900, Dr. Fülleborn gives some of the results of limnological researches made by him in Nyasa, Rukwa, and one or two of the smaller lakes of Northern Nyasaland, in connection with his zoological work. Dr. Fülleborn's apparatus did not permit of soundings below 330 metres (180 fathoms), which depth was obtained in 11° 39' 5 S., 34° 40' E. In the deep water off Langenburg and Wied Hafen, the floor of the lake was found to consist of a dark foul-smelling mud, with remains of organic substances, while at the deepest sounding above mentioned a greenish-grey mud was brought up. Where not befouled by the entrance of rivers, the lake-water was of a deep blue, and so transparent that a dish measuring 16 inches could be seen at a depth of over 50 feet. In the more muddy water near the north end, this was not possible below 38 feet. Temperature observations taken in deep water off Langenburg in December, 1899, showed that the maximum gradient occurred between 50 and 60 metres (about 165 and 195 feet). On the surface the temperature was 83° Fahr.; at 165 feet still 80°; at 195 feet it had fallen to 74½°; while at 620 feet it was 72½°. Dr. Fülleborn was able to detect fluctuations of small period in the level of the lake, though unable to keep a systematic record. The currents in the lake were found to vary frequently in rate and direction. In Rukwa, which was visited at the height of the dry season (June), a maximum depth of 10½ feet was observed. This was near Kipimbi, where the shore is formed by mountains. The floor of the lake is generally composed of a greyish-white clayey mud, which is stirred up by the winds, making the whole water appear milky. The lake is very brackish, and contains great quantities of fish. Of the small crater-lakes examined, the largest was that named by its discoverers Lake Wenzel, which lies at a height of 6500 feet on the Ngozi volcano. It is surrounded both above and below water-level by steep rocky walls, and has a depth of some 230 feet. The water is greenish and turbid, with a distinctly brackish taste.

Visit to the Okavango River.—A short account of a recent journey to the middle course of the Okavango, made through German South-West Africa by Lieut. Eggers, appears in the third number of the *Mitteilungen aus den Deutschen Schutzgebieten* for the present year. It contains some interesting details respecting the present relations of the native tribes of that region. A special point to which

attention is drawn is the recent encroachment of the Bechuanas in the region of the Okavango and Kwito, including a portion of German territory, which they now treat as their own domain. They have no intention of settling for the purpose of cultivating the land, but they use it as a hunting-ground, supplying the bushmen also with ammunition, and taking from them the animals killed. The Ovambos have been reduced to great poverty by the depredations of the Bechuanas, and now live on wild fruits and fish, doing a little trade also in ivory and ostrich feathers. They receive in exchange ammunition, which they again trade away, and much of it, Lieut. Eggers thinks, finds its way into German South-West Africa. It comes originally, he says, from British territory. On the Zambezi little damage seems to have been done by the rinderpest, and enormous quantities of cattle are now to be met with to the south and west of Lialui, even as far as German territory. Lieut. Eggers thinks that this may form a valuable source of supply for the German settlers. Although the journey was made in the driest time of the year (October), the Okavango, which was followed down some 60 miles, was found to be a rapid stream, with an average breadth of over 100 yards. The rapids did not form obstructions to its navigation by canoes. At the end of the dry season the water-level is from 4 to 20 feet below the top of the banks; but as these are overflowed for some distance during the rains, the river must then bring down a great body of water. The flooded area is traversed by wooded sandhills. Lieut. Eggers points out the need of the digging of wells in the sandy districts traversed by him, which must, he says, possess large stores of underground water, the plentiful rainfall sinking entirely beneath the surface.

Exploration within the Bend of the Congo.—We learn from the *Mouvement Géographique* (No. 26) that a journey of exploration has been made by M. Rue, an official of the Congo State, in the hitherto unknown region about the sources of the Ruki and Lukenye, within the Congo bend. In this locality a vast marsh, called Tope-Tope by the natives, was discovered, while the whole country on both banks of the middle Lomami is also extremely swampy. These facts may account for the reports, circulated so long by Arab traders, of a great lake to the west of the upper Congo. In the dry weather a path exists across the Lomami marsh, by which the distance between that river and Zendwe on the Congo can be covered in two days. If this is true, it would appear that the two rivers are really closer together at this latitude than they have been shown on our maps.

Von Stein's Surveys in the Southern Cameroons.—We have already referred (*Journal*, vol. xiv. p. 664) to the surveys of Baron von Stein in the southern interior of the Cameroons, which seemed likely to modify considerably the mapping of that part of the territory. They have now been worked out in Berlin by the traveller himself, and embodied in a large-scale map (1:150,000) in four sheets by Max Moisel, which is issued with the second number of the *Mitteilungen aus den Deutschen Schutzgebieten* for the present year. In an accompanying note Herr Moisel explains the nature of the surveys, which were executed with extreme care and unusual detail by Baron von Stein, the direction of the march being taken on an average every two or three minutes, and often at intervals as short as half a minute. The forest-clad nature of the country gave little opportunity for supporting the itinerary by bearings of distant objects, but the results, when put down on the map, show a very satisfactory agreement. The great desideratum for the cartography of this region is the definite fixing of points by astronomical observations, only four reliable latitudes, obtained by Captain von Besser, being available, while no accurate survey connects the region in question with the coast. The map embraces the whole central portion of the basins of the Nyong and Lokunje, the courses of which are considerably altered as compared with their delineation on

former maps, based chiefly on the surveys of Kund, Tappenbeck and Morgen. Herr Moisel remarks that it has been found quite impossible to embody the results of those surveys on the map, which therefore takes no account of them. This is explained by the fact that, owing to untrustworthy guides or the flight of the natives from their villages, the names of the latter could rarely be ascertained, so that east of Lolodorf hardly a single place or river-crossing could be identified with certainty. In portions of the Lokunje basin and neighbouring parts of that of the Nyong, the direction even of the streams is reversed, as compared with former maps. A considerable portion of the middle course of the Nyong remains unsurveyed.

AMERICA.

Report of the Canadian Department of the Interior.—The recently issued report of this department for 1899 contains a vast amount of information on Canadian settlement, irrigation, surveys, forestry, and similar subjects. It is, in fact, of so voluminous a character that the really valuable geographical information included runs the risk of being missed through the difficulty of sifting it from the midst of material of less general interest. Appended to the section dealing with Dominion lands are two maps, which show in a graphic way the proportion of the area of Manitoba and the North-West territories which had been thrown open to settlement, and that under crop, respectively, in 1899. The smallness of the areas so dealt with is very striking, especially in the case of the North-West territories, where the acreage under crop is little over one-fifth of that in Manitoba, in spite of the enormously greater area of the former. The immigration statistics show that out of a total of 44,543, representing the arrivals of declared settlers in 1899, nearly 12,000 were from the United States, 10,660 from the United Kingdom (including only 747 Irish), while of the remainder the largest part was made up by "Dukhoborts" (over 7000) from Southern Russia and Cyprus, and by Galicians (6700). The settlers were well up to the mark as a desirable class. The report of the Surveyor-General shows that a large amount of surveying work was done during the year, of most general interest being, perhaps, that of the northern boundary of British Columbia and those in the Yukon district. The former was the work of two parties, under Messrs. White-Fraser and St. Cyr respectively. Much of the country traversed by the latter was extremely mountainous, and therefore of an exceptionally impracticable nature, the direction of the ranges being at right angles to the boundary. The reports of the individual surveyors are given as appendices, among which are included those of Messrs. St. Cyr and McArthur on explorations in 1898 of various eastern tributaries of the Yukon, maps of which accompany the report. Mr. St. Cyr was able to obtain a general knowledge of the mountainous country traversed by the Nisutlin and Big Salmon rivers, the former of which proved to be navigable for 50 miles. Spruce of large size, poplar, and cotton-wood grow on the bottom lands of its valley, pine is found on the top of the benches, whilst birch and balsam fir prevail on the mountain slopes. Animal-life is abundant both in the forest and on the river. The region drained by the Big Salmon river may be divided into two sections, each with distinctive features. On the east are massive rugged mountains furrowed by deep gorges and ravines, the snow, which never disappears from their summits, acting as a feeder to the numerous tributaries of the Big Salmon river. Further west the mountains lose their forbidding aspect, and in its lower course the river flows through terraced country, the width of the valley constantly increasing. Mr. McArthur's work was carried out in the country drained by the Stewart and Macmillan rivers, the former being the first large tributary of the Yukon from the east below the junction of the Lewes and Pelly. Its headwaters are carried much further east, as a result of the recent

survey, than had been shown in our maps—nearly to 130° W.—and it is described as a magnificent stream. Lastly, in the section of the report dealing with forestry, attention is once more called to the regrettable destruction of forests by fires, and some practical suggestions made for the remedy of the evil.

The Boundary between Colombia and Costa Rica.—The award of the President of the French Republic, acting as arbitrator in the boundary dispute between Colombia and Costa Rica, was made public on September 15 last. The boundary will in future run as follows: Starting from Cape Mona, on the Atlantic ocean, it will first follow the spur of the Cordillera, enclosing the valley of the Tarire on the north, and afterwards the continental water-parting up to 9° N. It will then follow the water-parting between the Chiriqui Viejo and the feeders of the Golfo Dulce (Pacific ocean), terminating on this side at Point Burica. The islands near the coast to the east and south-east of Cape Mona are assigned to Colombia, those to the west and north-west to Costa Rica. All the more distant islands between the Mosquito coast and the isthmus of Panama, viz. Mangle Chico, Mangle Grande, Cayos de Albuquerque, San Andres, Santa Catalina, Providencia, and Escudo de Veragua, and all that formed part of the old province of Cartagena (the canton of San Andres), will belong to Colombia. On the Pacific side, the Burica islands and all to the east of Point Burica are assigned to Colombia; those to the west of the same point to Costa Rica. By this decision a considerable area usually assigned to Costa Rica on our maps now goes to Colombia, and at the same time forms part of South, instead of North, America.

Explorations in Eastern Bolivia.—The September number of *La Géographie* contains some notes of exploring journeys made by a French engineer, M. Cerceau, in Eastern Bolivia, during the past nine years. In these journeys, undertaken partly on behalf of the Bolivian Government, for the purpose of tracing out new roads, and partly in search of mineral deposits, M. Cerceau in many cases deviated from routes hitherto followed, and his map differs in certain particulars from that of Mr. Minchin, published in the *R.G.S. Proceedings* for 1881 (p. 448). From Jujuy, in North-West Argentina, he made his way, after one unsuccessful attempt, by the valley of the Vermejo to Tarija, and thence to Santa Cruz, passing through the territory of the Chiriguano, then goaded to rebellion by the tyranny of the colonists. From Santa Cruz he explored a new route to Pampa Grande, by Buena Vista (not visited by Minchin) and the valley of the Yapacani, a tributary to the Mamore, several difficult passes and virgin forests having to be traversed. The Yapacani flows in part through narrow gorges, in part through plains in which it spreads out and divides into several branches. The forest trees noticed included the quina and copaiba, and among others the "ajo," a very large tree, which gives forth from its bark, when wounded, a penetrating odour of garlic. M. Cerceau next travelled through the mining districts of the Chiquitos country, visiting the ancient establishments of the Jesuits, now for the most part in ruins, and finally making his way to the Brazilian town of Corumba, on the Paraguay. After crossing the Tucabaca, the road leads through forests of curupu and coca, which are, however, not in any way utilized. The former is a large tree which secretes gum arabic, its bark likewise yielding tannin. Further on, the uninhabited swampy tract which extends to the Paraguay is reached. M. Cerceau's last journey took him north from the Chiquitos country, to the caoutchouc-yielding forests of the Guapore, where a tribe of uncivilized Indians was encountered. The Paraguay, down the valley of which the route lay, proved to be for the most part a dry river-bed, with stagnant pools at intervals, and stretches of running water. M. Cerceau's narrative brings out the fact of the large number of Frenchmen to be found here and there in the most out-of-the-way parts of Bolivia, and also points to the great

mineral wealth of the eastern districts, especially the Chiquitos country. Gold, argentiferous galena, platinum, mercury, and rock-salt are among the most important minerals represented.

Railway Project in Southern Bolivia.—We learn from the German paper *Export* that a project has been set on foot by a German syndicate for the construction of a railway which, with its various branches, is to open up the whole southern half of Bolivia. It is proposed that the line shall start from a port on the Paraguay, and lead thence to Santa Cruz de la Sierra, with branches from the latter town to Sucre, Cochabamba, Oruro, La Paz, and Potosi. It is thought that no difficulties will be raised by the Bolivian authorities.

AUSTRALASIA AND OCEANIC ISLANDS.

Visit to the French Islands and the North Coast of New Britain.—The *Deutsches Kolonialblatt* for October 1 contains the account of a voyage made in June and July last by the Governor of German New Guinea (Herr v. Bennigsen) in the *Möwe* to the north coast of New Britain and the French islands, which lie to the north-west of the first-named island. Dr. Koch, who was at that time engaged in his malaria investigations in the German protectorate, and the geologist Dr. Pflüger, also took part in the voyage. During a visit to Hixen bay, on the north-west side of the isthmus which joins the Gazelle peninsula to the rest of the island, the large river which enters the bay was ascended in the ship's boat for some distance, and was found to flow through a broad fertile plain, hardly touched by the hand of man. The stream, which brought down huge trunks of trees, has a wide mouth, and is not obstructed by a bar. It appeared to be navigable for boats and small steamers for a considerable distance. The three volcanoes (two of them active) known as the Father and Sons, which lie to the west of Hixen bay, are outside the main mountain range of New Britain, which in this neighbourhood runs parallel to the coast, and is composed of two or three separate chains. The next point reached was the volcanic island of Deslacs, in the French group, where surveys were carried out in Peterhafen, and the entrance marked by buoys. The smaller inner harbour, surrounded with steep wooded cliffs, was found to offer perfect shelter even to large ships. The population of Deslacs has been decimated by small-pox, and many of its coconut plantations are now ownerless, so that traders make a good harvest. After a visit to Mérite (Unea), which was found to be thickly peopled, a course was laid for the Willaumez peninsula, the land projecting from the north side of New Britain, which was taken by D'Entrecasteaux to be a group of islands, and was first conjectured to be a peninsula by von Schleinitz in 1887. The correctness of von Schleinitz's view seems to have been proved during a voyage of the *Möwe* in 1896, during which a harbour (Hannamhafen) was discovered on the eastern side in 5° 16' 28" S. lat. (cf. *Deutsches Kolonialblatt*, 1896, p. 413; *Mitt. aus den Deutschen Schutzgebieten*, 1897, p. 192). This was again visited during the present year, and an excursion made to a series of geysirs, the steam of which had been seen from a distance. Photographs of these are reproduced in the *Kolonialblatt*. Natives were encountered near the shores of the harbour, and, though at first shy, they finally became friendly and allowed themselves to be photographed. Their canoes are of an unusual length, and well made. Lastly, a visit was paid to North island in the French group, where another geyser was examined. In this, as in other islands of the group, Dr. Koch ascertained that malaria is endemic.

Annexation of the Cook Archipelago.—On October 8, Lord Ranfurly, Governor of New Zealand, visited Raratonga, the principal island of the Hervey or Cook archipelago, and, at the unanimous request of the native chiefs, formally

annexed the group, the British flag being hoisted in the presence of a large assembly. The Cook islands have been a British protectorate since 1888, being included within the area placed under the authority of the High Commissioner for the Pacific; but the executive government has hitherto been in the hands of a native council, the enactments of which, however, have required confirmation by the British resident at Raratonga.

POLAR REGIONS.

The Missing Members of the Duke of the Abruzzi's Expedition.—The *Aftenposten* of Christiania for October 3 contains an account of the opening proceedings of the inquiry, lately held at Sandefjord, into the circumstances attending the loss of three members of Captain Cagni's sledge expedition to the north. The examination of Captain Cagni occupied the greater part of the day, close inquiry being made into the plan and arrangements of the expedition, and especially the considerations which had determined the composition of the return parties. It transpired that this had not been decided on beforehand, the idea being that those members of the original party who showed themselves most fit should accompany the leader to his furthest point. The sending back of the Norwegian engineer, Støkken, one of the three missing men, seems to have been dictated partly by national feeling, the choice lying between him and an equally competent Italian. Captain Cagni gave it as his own opinion that the unfortunate men must have perished, for otherwise they would certainly have made their way either to Spitzbergen, Teplitz bay, or Cape Flora. All hope has not, however, been abandoned that they may be still alive, and the duke has announced his intention of sending a steamship to Cape Flora in the spring, if it shall be possible to reach that point. Letters were left at Teplitz bay, with instructions to the men to proceed to Cape Flora, while supplies sufficient for twenty men for three years were left at the former place, and for the same number for eight months at the latter. When starting back for the ship, which was distant some 60 miles, the three men were in the best of spirits, and had provisions for ten days, with 70 lbs. of pemmican for ten dogs.

Voyage of the "Windward."—It is announced in the *Brooklyn Standard Union* of October 9 that a letter from Captain Bartlett, dated Godhavn, August 10, was that morning received by the secretary of the Peary Arctic Club. This news is welcome, as removing the cause for anxiety respecting the success of the voyage, which had been felt in some quarters, since the announcement that the *Windward* had met with serious hindrance from ice off the coast of Labrador. Captain Bartlett makes no mention of unusual difficulties on this score, and as two-thirds of the distance from Sydney to Cape York had been covered (in great part under canvas) at the time of writing, the progress seems satisfactory. At Godhavn Captain Bartlett obtained the suits of skin clothing and boots which had been ordered last year by Peary, whom he hoped to find at Cape York. The crew of the *Windward* was shipped for two and a half years, and, as the coal and supplies are ample, there need be no ground for apprehension, even though the ship should not again be heard of this year.

Expeditions to East Greenland.—Besides the Danish expedition to East Greenland under Lieut. Amdrup, that which left Sweden this summer under Prof. Kolthoff has met with considerable success in the prosecution of its object—the study of the zoology of the East Greenland coast. The expedition has returned to Trondhjem, bringing with it two young musk-oxen, which it is hoped to acclimatize in Northern Sweden. The coast of East Greenland was followed from Cape Broer Ruys to Pendulum island, the spot where a depôt of provisions was left last

year by Prof. Nathorst for the possible use of Captain Sverdrup if successful in sailing round the north coast of Greenland. That Captain Sverdrup had not, so far, been successful in this object was shown by the fact that the depôt remained untouched. Contrary to the state of things which has prevailed this year around Spitsbergen, the east Greenland coast has been, apparently, unusually free from ice, the Norwegian whaler *Cecilie Malene* (Captain Naero), which returned to Tromsø in August, having been able to follow the coast (as we learn from *Petermanns Mittheilungen*) to the high latitude of $75^{\circ} 30' N.$, a point further north than is positively known to have been reached by a ship. Captain Naero is said to have also brought home living specimens of musk-oxen.

The Spitsbergen Degree Measurement.—The unfavourable meteorological conditions which have prevailed this summer in Spitsbergen have much hindered the operations of the Russian and Swedish parties for the measurement of an arc of the meridian in that country. Owing to the state of the ice, the *Svensksund* (*ante*, p. 111) was unable to reach the Swedish winter station in Treurenberg bay ($80^{\circ} N.$) until the beginning of August. The Swedish party was unable to reach North-East Land at all, and a connection between the northern and southern surveys has not been effected. Some good work was, however, done by the Russian party in the south. This had wintered on Horn sound, and in the spring commenced work on the Stor fjord, afterwards moving to Ice fjord, while surveys were carried across the southern part of Spitsbergen. Both parties returned to Tromsø about the middle of September.

Baron Toll's Auxiliary Arctic Expedition.—M. K. A. Volossovitch, leader of the auxiliary expedition which is to act in conjunction with Baron Toll, left St. Petersburg for Irkutsk on October 14. He will there be joined by a geodesist-topographer, N. M. Orloff, and the expedition will be definitively organized. Its programme has lately been widened, so as to include astronomical, magnetical, and meteorological observations, in addition to the geological and topographical ones. From Irkutsk the two explorers will proceed to Verkhoyansk, and thence to Ust-yansk, at the mouth of the Yana, which they expect to reach in December. The necessary preparations for the journey will there be made, and the two explorers, accompanied by two Cossacks and seven or eight Yakuts, hope to start in April next in dog-sledges for the New Siberia islands. On Lyakhoff island they will part company, Volossovitch going to Kotelnyi island, and Orloff to New Siberia. The chief aim of this auxiliary expedition is to form new depôts of provisions, and visit the three already established in different parts of the archipelago, so as to provide for the eventuality of Baron Toll being forced to abandon his schooner. News has been received that the *Sarya*, with Baron Toll's expedition on board, reached Yugor strait on August 20, and was about to attempt the passage of the Kara sea, which appeared to be free from ice.

Mr. Borchgrevink's Map of South Victoria Land.—On the margin of the main map illustrating Mr. Borchgrevink's antarctic expedition, in the October number of the *Journal*, p. 500, "East" and "West" on the degrees of longitude should be transposed.

GENERAL.

The Oxford School of Geography.—The Rev. E. C. Spicer, of New College, has been elected to the scholarship in connection with the Oxford School of Geography. He had previously been placed in the First Class in Geology by the examiners in the Natural Science Honour School, and had obtained a Burdett-

Coutts scholarship. One condition attached to the geographical scholarship is that the successful candidate shall attend the school for one year.

Fields for British Enterprise.*—In his recently published introductory volume to the series of Practical Handbooks for Prospectors, Settlers and others, now being issued by Messrs Griffin & Co., Dr. Mill has aimed at presenting "a short, simple, and practical account of the conditions of life in those parts of the world where there is still an opening for the energies of English-speaking people desiring to make their home or invest their capital in a new country." The importance of the work is at once apparent from this statement of its scope, as given in the preface, the ground covered having been hitherto almost entirely neglected; for, in spite of the abundant supply of handbooks and guides to individual countries, there has been a decided want of a comprehensive and systematic treatment of the subject, on a scale which should admit of the presentation of the required facts without losing sight of the general principles which must be kept in view by those interested in the development of new countries. This want has been admirably supplied, so far as the temperate regions are concerned, in Dr. Mill's volume, which possesses besides the advantage of being written by a professed geographer, who is able to maintain a due proportion between the various factors by which life in new countries is conditioned. The second chapter is of particular interest, as dealing with the general principles which, in Dr. Mill's opinion, should be kept in view by those who consult the volume. These have already been sketched in an article to which reference has been made in the *Journal* (vol. xv. p. 652), and it is therefore unnecessary to say more here on this head. The succeeding chapters take in succession the various British colonies in the northern and southern hemispheres and other extra-European countries which may be regarded as offering scope to British enterprise, the treatment of Canada, in chapters iii. to v., being particularly full and suggestive. The United States, Mexico, Temperate Brazil, Chile, and Argentina, have, as is fitting, less space allotted to them, for though it was no doubt necessary, for the completeness of the work, that these should be included, it cannot but be felt that with the wide field for enterprise offered by our own colonies, attention directed elsewhere is more or less misplaced. Dr. Mill lays stress, *e.g.*, on the great opening for the employment of capital which is offered by the vast but little developed mineral resources of Canada, which, so far as exploited, are largely utilized in enriching citizens of the United States. The most recent statistics have been made use of throughout, and numerous references of sources of information facilitate further study in any particular direction.

Medal of the Queensland Branch of the Royal Geographical Society of Australasia.—A scheme has been set on foot by the Queensland branch of the Royal Geographical Society of Australasia for the purpose of recognizing the services rendered to the Society in various capacities by Mr. J. P. Thomson, to whom the original idea of the foundation of the Society was due. It has been decided by the Council that a gold medal, to be designated "The Thomson Foundation Medal," shall be awarded annually, or at other times approved by the Council, to the author of the best original contribution to geographical literature which shall be approved and accepted by the Society. The subject of the contribution for which the medal is to be awarded will from time to time be named by the Council, preference being given to the geography of Australia.

* 'New Lands: their Resources and Prospective Advantages.' By Hugh Robert Mill, D.Sc., LL.D. London: Charles Griffin & Co. 1900.

CORRESPONDENCE.

The "Southern Cross" Expedition to the Antarctic.

THROUGH an oversight, Mr. Bernacchi's name was omitted as the author of the Meteorological and Magnetic Report in the publication of my paper in last month's *Journal*. I also wish to acknowledge that the map is the work of Mr. Colbeck, a member of my staff.

C. E. BORCHGREVINK,
Commander of the Expedition.

October 15, 1900.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., LL.D., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Académie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.

Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps.

Whymper.

Scrambles amongst the Alps in the years 1860-69. By Edward Whymper. Fifth Edition. London: John Murray, 1900. Size 9 × 6½, pp. xviii. and 468. *Maps and Illustrations*. Price 15s. net. Presented by the Publisher.

In a preface to the new edition Mr. Whymper refers to the great changes which time has wrought in the rocky southern slopes of the Matterhorn during an interval of about thirty years.

Alps—Glaciers.

Forel, Lugeon, and Muret.

Jahrb. Schweiz. Alpenclub 35 (1899-1900): 203-221.

Les variations périodiques des glaciers des Alpes. Par Dr. F. A. Forel, Dr. M. Lugeon, et E. Muret. Vingtième rapport. 1899.

Austria-Hungary.

Schoeller.

Trade of Austria-Hungary for the year 1899. Foreign Office, Annual No. 2483, 1900. Size 10 × 6½, pp. 32. Price 2d.

Balkans.

Z. Ges. Erdk. Berlin 35 (1900): 127-146.

Götz.

Die Frage der Vergletscherung des Central-Balkan. Von Prof. Dr. Wilh. Götz.

Bulgaria.

Trade of Bulgaria for the year 1899. Foreign Office, Annual No. 2493, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 52. *Plan. Price 1½d.*

Denmark.

Boyle

Trade and Agriculture of Denmark for the year 1899. Foreign Office, Annual No. 2455, 1900. Size $10 \times 6\frac{1}{2}$, pp. 26. *Plans and Diagram. Price 9d.*

Europe.

Jahrb. Ungar. Karpathen-V. 27 (1900): 51-75.

Englisch

Die Hohe Tatra und die Alpen, kurze vergleichende Studie von Karl Ritter von Englisch.

A comparison of the mountain ranges of the High Tatra and the Alps.

Europe.

Keller

Memel-, Pregel- und Weichselstrom, ihre Stromgebiete und ihre wichtigsten Nebenflüsse. Eine hydrographische, wasserwirtschaftliche und wasserrechtliche Darstellung. Auf Grund des Allerhöchsten Erlasses vom 28. Februar 1892 im Auftrage des preussischen Wasser-Ausschusses herausgegeben von H. Keller. 4 vols. Size 11×8 . Band i. Stromgebiete und Gewässer, pp. xviii. and 528; Band ii. Memel- und Pregelstrom, pp. 532; Band iii. Weichselstrom in Schlesien und Polen, pp. 522; Band iv. Weichselstrom in Preussen, pp. 494. Tabellenband, size 14×10 , pp. 190. Atlas, size $21\frac{1}{2} \times 18$. Berlin: Dietrich Reimer (Ernst Vohsen), 1899. *Presented by the Publisher.*

This is specially noticed on p. 552.

Europe.

Meteorolog. Z. 17 (1900): 289-317, 337-355.

Kremser

V. Kremser über die klimatischen Verhältnisse des Memel-, Pregel- und Weichsel-Gebietes.

On the climatic conditions of the basins of the Memel, Pregel, and Vistula on the borders of Germany and Russia.

Europe.

Commercial Relations of the United States with Foreign Countries during the year 1899. Vol. ii. [Europe.] Washington, 1900. Size $9\frac{1}{2} \times 6$, pp. 938.

France.

Rev. G. 47 (1900): 12-21.

Malotet

Le Cambrésis. Par M. A. Malotet. *With Sketch-maps.*

France.

A travers le Monde, Tour du Monde 6 (1900): 249-252, 257-260.

Roussel

Une ancienne Capitale—Orange. Par M. E. Roussel. *With Illustrations.*

The little town of Orange (the Roman Arausio), to the north of Avignon, retains some very fine specimens of Roman architecture.

France—Antibes.

Rev. Maritime 146 (1900): 5-21.

Vinson

Le port et le quartier maritime d'Antibes. Par M. Vinson.

France—Lorraine.

B.S.G. Lille 33 (1900): 369-400.

Merchier

Un coin de Lorraine. Le Barrois, Nancy. Par M. A. Merchier.

France—Savoy.

Le Globe, B.S.G. Genève 39 (1900): 95-107.

Pittard

Note préliminaire sur l'ethnologie de la Savoie et de Haute-Savoie. Par M. le Dr. Eugène Pittard.

Germany—Agriculture.

Höck

Pflanzen der Kunstbestände Norddeutschlands als Zeugen für die Verkehrsgeschichte unserer Heimat. Eine Pflanzengeographische Untersuchung von Dr. F. Höck. (Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. XIII. Band, Heft 2.) Stuttgart: J. Engelhorn, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 89-152.

A study of the kinds of plants cultivated in North Germany at different historical periods, and of the introduction of new varieties.

Germany—Bavaria.

Harford

Trade, Agriculture, and Finances of Bavaria for the year 1899 and part of 1900. Foreign Office, Annual No. 2489, 1900. Size $10 \times 6\frac{1}{2}$, pp. 22. *Price 1½d.*

Germany—Defence.

Hartmann

Warum hat jedermann im Volk ein Interesse an einer starken deutschen Flotte? Von Hans Hartmann. Size 9×6 , pp. 32. *Map. Price 10 pfennige. Presented by the Author.*

A map shows how easily a hostile fleet could blockade the German ports, and the text urges the creation of a powerful German fleet.

Germany—Elbe.

Der Elbstrom, sein Stromgebiet und seine wichtigsten Nebenflüsse. Eine hydrographische, wasserwirthschaftliche und wasserrechtliche Darstellung. Im Auftrage der deutschen Elbuferstaaten und unter Bethheiligung des preussischen Wasser-Ausschusses herausgegeben von der Königlichen Elbstrombauverwaltung zu Magdeburg. 3 vols. (in 4). Size 11 × 8. Band i. Das Stromgebiet und die Gewässer. (Allgemeine Darstellung.) Pp. xvi. and 634. Band ii. Beschreibung der einzelnen Flussgebiete. Pp. 340. Band iii. Strom- und Flussbeschreibungen der Elbe und ihrer wichtigsten Nebenflüsse. 1. Abtheilung. Die Elbe von der Quelle bis zur Mündung. Pp. 436. 2. Abtheilung. Die wichtigsten Nebenflüsse der Elbe. Pp. vi. and 570. Tabellenband. Size 14 × 10½, pp. 258. Atlas. Size 21 × 18. Berlin: Dietrich Reimer (Ernst Volsen), 1898. *Presented by the Publisher.*

This important work is specially noticed on p. 552.

Germany—Prussia.**Oppenheimer.**

Trade of Frankfort-on-Main for the year 1899. Foreign Office, Annual No. 2484, 1900. Size 9½ × 6, pp. 62. *Price 3d.*

Germany—Rhine.*Geolog. Mag* 7 (1900): 349-366.**Jennings.**

The Geology of Bad Nauheim and its Thermal Salt-springs. By A. Vaughan Jennings. *With Sketch-map, Plan, etc.*

Germany—Saxony.

Kalender und Statistisches Jahrbuch für das Königreich Sachsen . . . auf das Jahr 1901. Herausgegeben vom Statistischen Bureau des Königl. Sächs. Ministeriums des Innern. Dresden: C. Heinrich, 1900. Size 9½ × 6½, pp. 94, viii., and 282. *Presented by the Statistical Bureau of Saxony.*

Greece.**Frazer.**

Pausanias and other Greek Sketches. By J. G. Frazer. London: Macmillan & Co., 1900. Size 7½ × 5, pp. x. and 420. *Price 5s. Presented by the Publishers.*

The longest article in this volume, which throughout is popular without ceasing to be scholarly, is the account of Pausanias, which served as an introduction to the author's great work on Pausanias' 'Description of Greece.' The other articles are numerous. For the most part they are short sketches of scenery or narratives of journeys in Greece, or reminiscences of the part played by philosophers and prominent citizens of Greece in the days of its ancient glory.

Hungary—Carpathians. *Jahrb. Ungar. Karpathen-V.* 27 (1900): 135-139. **Czirbusz.**
Am Ozernya-See. Von Dr. Géza Czirbusz.

Hungary—Transylvania. *Jahrb. Ungar. Karpathen-V.* 27 (1900): 1-50. **Siegmeth.**
Wanderungen im Siebenbürgischen Erzgebirge und im Bihar-Kodru-Gebirge. Von Karl Siegmeth.

Iceland.*B.S.G. Lille* 33 (1900): 401-408.**Bonaventure.**

L'Islande. Par le Père Bonaventure.

Italy—Belluno.*Mem. S.G. Italiana* 9 (1899): 178-222.**Dal Piaz.**

Grotte e fenomeni carsici del Bellunese. Memoria del dott. Giorgio Dal Piaz. *With Plates.*

On the limestone grottoes of North-Eastern Italy.

Italy—Borax.*Mem. S.G. Italiana* 9 (1899): 105-142.**Stefani.**

La produzione dell' acido borico e del borace specialmente in Italia, del Prof. Carlo de Stefani.

On the boracic acid springs of Italy, with reference to the distribution of deposits of borax throughout the world.

Italy—Canal.*T.R.S. Literature* 21 (1900): 177-206.**Marks.**

Nero's Great Canal, with some remarks on Roman War Gallies. By Alfred Marks. *With Map.*

Suggests the identification of the Grotta di Pace on the shore of Lake Avernus, with the first section of Nero's projected canal from the lake to Rome. The dimensions of a Roman war-galley are deduced from the width of the tunnel, viz. 14 feet.

Italy—Elba.**Tonietti.**

Trade of Elba for the year 1899. Foreign Office, Annual No. 2458, 1900. Size 10 × 6, pp. 12. *Price 1d.*

- Italy—Giglio Island.** [Ludwig Salvator.]
Die Insel Giglio. Prag: H. Meroy Sohn, 1900. Size $12\frac{1}{2} \times 9\frac{1}{2}$, pp. vi. and 128.
Map and Illustrations. Presented by the Archduke Ludwig Salvator.
A small granitic island in the Tyrrhenian sea, which has been made the subject of one of the Archduke Ludwig Salvator's sumptuously illustrated monographs.
- Italy—Lecce.** Cocoto.
Trade of the Province of Lecce for the year 1899. Foreign Office, Annual No. 2496, 1900. Size $9\frac{1}{2} \times 6$, pp. 36. Price $2\frac{1}{2}d$.
- Italy—Sardinia.** Pernis.
Trade of Sardinia for the year 1899. Foreign Office, Annual No. 2474, 1900. Size 10×6 , pp. 10. Price $1d$.
- Italy—Sicily.** B.S.G. Italiana 1 (1900): 542-547. Baratta.
Sullo stato presente dei vulcani eolici, nota del M. Baratta.
On Vulcano and Stromboli.
- Italy—Sicily.** C. Rd. 131 (1900): 317-319. Janssen.
Sur l'observatoire du mont Etna. Par M. J. Janssen.
- Italy—The Marches.** Riv. G. Italiana 7 (1900): 353-370. Marinelli.
Primi materiali per la storia della cartografia marchigiana di Olinto Marinelli.
Materials towards the history of the cartography of the Italian province known as The Marches.
- Italy—Venetia.** Riv. G. Italiana 7 (1900): 371-387. Bertolini.
Della linea e dei fiumi di resorgiva in relazione al territorio veneto del Prof. G. Lod. Bertolini.
- Norway.**
Norway: Official Publication for the Paris Exhibition, 1900. Kristiania: Aktie-Bogtrykkeriet, 1900. Size $10\frac{1}{2} \times 7$, pp. 626 and xxxiv. *Map and Illustrations. Presented by the Norwegian Government.*
This fine work on Norway gives an authoritative description of the country such as has not previously existed in the English language, or indeed in any language in so convenient a form. The geographical situation and topography are treated by Dr. A. M. Hansen, the geology by Dr. H. H. Reusch, the climate by Mr. Axel Steen. Then follow chapters on flora, fauna, people, history, political conditions, administration, finance, education, resources, trade, literature, art, and many other topics. As appendices, the Constitution of Norway and the Act of Union are translated in full.
- Norway.** Dundas.
Trade of Norway for the year 1899. Foreign Office, Annual No. 2471, 1900. Size 10×6 , pp. 84. Price $4\frac{1}{2}d$.
- Norway.** Blackwood's Mag. 168 (1900): 336-349. Maxwell.
The Valley of Enchantment. By Herbert Maxwell.
A description of the Romsdal.
- Norway.** B. American G.S. 32 (1900): 199-219. Barrett.
The Sundal Drainage System in Central Norway. By R. L. Barrett. *With Maps.*
This is a study by one of Prof. W. M. Davis's students, first worked out on the maps in the geographical laboratory at Harvard, then revised by work in the field.
- Norway.** Norske G. Selsk. Aarbog 10 (1898-99): 90-92. Reusch.
Et stykke af det Timanske bjergkjædesystem i Norge af dr. Hans Reusch. *With Sketch-map.*
- Norway—Glacier Lakes.** Norske G. Selsk. Aarbog 10 (1898-99): 93-99. Reusch.
Bræsjøer i fordums tid af dr. Hans Reusch. *With Sketch-maps and Illustrations.*
- Norway—Historical.** Norske G. Selsk. Aarbog 10 (1898-99): 1-13. Storm.
Et brev til pave Nicolaus den 5te om Norges beliggenhed og undre af Prof. dr. Gustav Storm.
- Norway—Lakes.** Norske G. Selsk. Aarbog 10 (1898-99): 83-89. Holmsen.
Vore største indsjøer af cand. min. Andreas Holmsen.
Area in square kilometres, height above sea, and depth of the chief lakes of Norway.

Norway and Spitsbergen. *Mem. S.G. Italiana* 9 (1899): 82-104.

Sulle coste di Norvegia e delle Spitzberghe. Appunti di un viaggio compiuto nell'estate 1898 dall' yacht "Jela" di proprietà di S.A.R. il Principe di Napoli.
With Map and Illustrations.

Extracts from the log of the *Jela* in the summer of 1898, with a chart showing the route and several views of the west coast of Norway and of Spitsbergen.

Portugal.

Pereira.

Elementos de logographia industrial. A industria Portuguesa (seculos xii. a xix.) com uma Introdução sobre as corporações operarias em Portugal. Por J. M. Esteves Pereira. Lisboa, 1900. Size $7\frac{1}{2} \times 5$, pp. xl. and 42. *Presented by the Author.*

Russia.*Mém. Comité Géol. Russe* 7 (1899): 1-100.

Zemjatschensky.

Untersuchungen über Geologie und Bodenverhältnisse im Kreise Borowitschi. Prof. P. Zemjatschensky. *With Maps.* [In Russian, with German abstract.]

Russia—Military Cartography. *M. Militär-G.I.* 19 (1899): 223-256.

Truck.

Die Entwicklung der russischen Militär-Kartographie vom Ende des 18. Jahrhunderts bis zur Gegenwart, . . . bearbeitet von Sigismund Truck.

Russia—Taganrog.

Hunt.

Trade of Taganrog and District for the year 1899. Foreign Office, Annual No. 2447, 1900. Size 10×6 , pp. 32. *Price 2d.*

Servia—Settlement.*Abh. k.k. G. Ges. Wien* 2 (1900): 21-89.

Smiljanic.

Beiträge zur Siedelungskunde Südscribiens. Von Dr. Manojlo V. Smiljanic.
With Map.

Slav Race.*Globus* 77 (1900): 331-334, 352-355.

Rhamm.

Zur Entwicklung des slavischen Speichers. Von Karl Rhamm. *With Illustrations.*

On the granaries and other store-houses of the Slavs.

Switzerland.

Brückner.

Die Schweizerische Landschaft einst und jetzt. Rektoratsrede gehalten am 18. November. 1899. Von Dr. Eduard Brückner. Bern: Schmid & Francke, 1900. Size 10×7 , pp. 32. *Presented by the Author.*

This address touches on the geographers of Switzerland, and then discusses the present and past conditions of the surface of the country with reference to climate, glaciers, and the effect of erosion.

Switzerland.

Knapp and Borel.

Geographisches Lexikon der Schweiz. Herausgegeben unter der Leitung von Charles Knapp und von Maurice Borel in Verbindung mit Fachmännern aus allen Kantonen Nos. 1 and 2. Aa—Achenflüh. Neuenburg: G. Attinger, 1900. Size $11\frac{1}{2} \times 7\frac{1}{2}$, pp. 32. *Maps and Illustrations. Presented by Herr Heinrich Brunner.*

The beginning of a comprehensive gazetteer of Switzerland, which will be completed in about one hundred parts. Special features are the attention given to the meaning and derivation of place-names and the numerous maps in the text, all drawn on a uniform system.

Switzerland.*Le Globe, B.S.G. Genève* 39 (1900): 109-112.

Rosier.

Le milieu géographique suisse considéré comme facteur du développement historique. Par M. W. Rosier. (Résumé.)

Switzerland.

Annuaire Statistique de la Suisse. Publié par le Bureau de Statistique du Département Fédéral de l'Intérieur. Huitième Année, 1899. Bern, 1899. Size $10 \times 6\frac{1}{2}$, pp. iv. and 410.

Turkey.*M. Militär-G. I.* 19 (1899): 217-222.

Die Karte der europäischen Türkei 1: 210,000, herausgegeben vom kaiserl. Ottomanischen Generalstabe. *With Maps.*

Description of the recently published map of European Turkey brought out by the Turkish Government.

Turkey.

Wilson

Handbook for Travellers in Constantinople, Brusa, and the Troad. London: John Murray, 1900. Size $7 \times 5\frac{1}{2}$, pp. xii., 40, and 174. *Maps and Plans.* Price 7s. 6d. Presented by the Publisher.

This handbook deals with the parts of Asiatic Turkey readily accessible from Constantinople, and with the capital itself. The present edition has been revised by the original editor, Sir Charles W. Wilson.

Turkey—Albania. *B.S.G. Italiana* 1 (1900): 505-521, 581-601, 681-699.

Baldacci

Itinerari albanesi, del dott. Antonio Baldacci. With Map.

The author made a series of excursions from Vallona into the interior of Albania in 1892 and 1894, paying special attention to the botany of the region.

United Kingdom—Bibliography.

Catalogue of the Literature and History of the British Islands. Part iii. Offered at the Net Prices affixed. By Bernard Quaritch. January 1, 1900. Size $9\frac{1}{2} \times 6$, pp. 213-298. Price 1s. Presented by Mr. B. Quaritch.

United Kingdom—England

Ward

Thorough Guide Series. North Devon [including West Somerset] and North Cornwall from Exmoor to the Scilly Isles, with a description of the various approaches. By C. S. Ward, M.A. Twenty Maps and Plans by J. Bartholomew. Seventh Edition—Revised. London: Dulau & Co., 1899. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. xvi. and 160. Price 3s. 6d. net. Presented by the Publishers.

United Kingdom—England.

Eaton

Returns of Rainfall, etc., in Dorset in 1899. By Henry Storks Eaton. (From *Proceedings of the Dorset Natural History and Antiquarian Field Club*, vol. xxi., 1900.) Dorchester, 1900. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 14. Presented by the Author.

Gives monthly returns from fifty-two stations, including one in Devon and two in Wilts.

United Kingdom—Ireland. *P.R. Irish A.* 5 (1900): 667-854.

The Fauna and Flora of Valencia Harbour on the West Coast of Ireland. With Charts and Plates.

A series of memoirs by specialists on the different forms of marine life obtained by a systematic investigation of Valencia harbour.

United Kingdom—Ireland.

Cooke

Handbook for Travellers in Ireland. Fifth Edition, Revised and Edited by John Cooke, M.A. London: John Murray, 1896. With Index and Directory for 1900. Size 7×5 , pp. x., 44, and 516. *Maps and Plans.* Price 9s. Presented by the Publisher.

This edition has been very much enlarged and provided with new maps and plans, so as to keep pace with the increased attention now being paid by tourists to the scenic and archaeological beauties of Ireland.

United Kingdom—London.

Baedeker

London and its Environs. Handbook for Travellers by Karl Baedeker. With 4 Maps and 21 Plans. Twelfth Revised Edition. Leipsic: Karl Baedeker; London: Dulau & Co. 1900. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. x., 452, and 44. Price 6m. Presented by Messrs. Dulau and Co.

United Kingdom—Scotland. *Scottish G. Mag.* 16 (1900): 385-416, 441-467.

Smith

Botanical Survey of Scotland. I. Edinburgh District. II. North Perthshire District. By Robert Smith, B.Sc. With Maps and Illustrations.

This is a remarkable piece of special surveying, and the maps showing the varieties of vegetation are of great interest. It is with much regret that the death of the talented author at the early age of twenty-six must be recorded.

United Kingdom—Wales.

Ward and Baddeley

Thorough Guide Series. South Wales and the Wye District of Monmouthshire. By C. S. Ward and M. J. B. Baddeley. Twenty-two Maps and Plans by Bartholomew. Fourth Edition—Revised. London: Dulau & Co. [1900.] Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. xvi. and 192. Price 3s. 6d. net. Presented by the Publishers.

ASIA.**Arabia.**

Zwemer

Arabia: The Cradle of Islam. Studies in the Geography, People, and Politics of the Peninsula, with an account of Islam and Mission-work. By Rev. S. M. Zwemer.

Introduction by Rev. James S. Dennis, D.D. Edinburgh and London: Oliphant, Andersen & Ferrier, 1900. Size $8\frac{1}{2} \times 6$, pp. 434. *Maps and Illustrations.* Price 7s. 6d. *Presented by the Publishers.*

This book meets a distinct want. It supplies a popular description of the whole of Arabia, a careful summary of Modern Arab modes of life and thought, and although written for a purpose—in connection with the American mission to Arabia—it is a useful epitome of information.

Asia—Railway to India. *Scottish G. Mag.* 16 (1900): 523-534. **Capenny.**

An Indo-European Highway. (An account of Colonel Mark Bell's views.) By S. H. F. Capenny. *With Maps.*

Asia—Travel. **Ookhtomsky.**

Travels in the East of Nicholas II., Emperor of Russia, when Cesarewitch 1890-1891. Written by Order of His Imperial Majesty by Prince E. Ookhtomsky, and translated from the Russian by Robert Goodlet (St. Petersburg). Edited by Sir George Birdwood, M.D., K.C.I.E., etc. Vol. ii. London: A. Constable & Co., 1900. Size 16×12 , pp. xii. and 518. *Portrait and Illustrations.* Price 52s. 6d. net. *Presented by the Publishers.*

This great volume completes the official account of the Tsar's eastern journey. It recounts the departure from India, the visits to Ceylon, Java, Singapore, Hongkong, China, and Japan, and the return across Siberia. The illustrations are numerous, the larger plates being fine engravings, but there is no map, no clear conspectus of the route, and no table of contents to the chapters, which are not provided with titles or notes of their contents.

Central Asia. *J. Asiatique* 15 (1900): 584-592. **Bonin.**

Note sur les anciennes Chrétientés nestoriennes de l'Asie Centrale. Par M. C. E. Bonin. *With Sketch-map.*

The map shows the seats of Nestorian archbishops and bishops in the middle of the fourteenth century, across Asia from Bagdad to Peking.

Central and Western Asia. *J. Bombay Br. R. Asiatic S.* 20 (1900): 217-233. **Modi.**

The Etymology of a few towns of Central and Western Asia, as given by Eastern writers. By Jivanji Jamshedji Modi.

Ceylon. **Leclercq.**

Anurádhapura sous les rois cinghalais. Par Jules Leclercq. Bruxelles, 1900. Size 9×6 , pp. 26. *Presented by the Author.*

China. *A travers le Monde, Tour du Monde* 6 (1900): 253. —

Les Sphères d'influence en Chine. *With Map.*

China. **Cholnoky.**

A Sárkányok Országából. Életkédek és utirajzok khinából. Irta: Cholnoky Jenő. Veszprém, 1900. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. xx. and 366. *Maps and Illustrations.* *Presented by the Author.*

In presenting this work 'From the Land of the Dragon,' the author regrets that, as it is only published in Hungarian, the text will reach few English readers, but he hopes that the illustrations may help to complete the impression of China derived from other works. This they will undoubtedly do, for they include not only excellent reproductions of photographs and outline sketches, but many diagrams elucidating points of detail.

China. *La G., B.S.G. Paris* (1900): 101-104. **Fauvel.**

L'œuvre géographique de la mission de Zi-ka-wei. Par M. A. A. Fauvel.

On the maps executed by the Jesuit mission in China; see note, *ante*, p. 556.

China. *Oester. Monats. Orient* 26 (1900): 73-76, 85-87. **Feigl.**

Der Aufstand der Boxer. Von Hermann Feigl.

China. *National G. Mag.* 11 (1900): 297-308. **Hubbard.**

Problems in China. By James M. Hubbard. *With Illustrations.*

China. *P.R. Artillery J.* 27 (1900): 145-163. **Pottinger.**

A Recent Survey in Western China. By Captain E. C. Pottinger. *With Map.*

Notes of a surveying journey from the Yangtse to the Burmese frontier in search of a railway route.

China. *National G. Mag.* 11 (1900): 309-319. **Webster.**

China and her People—some reflections on their Manners and Customs, Habits, and Lives. By Commander Harrie Webster. *With Illustrations.*

- China—Amoy.** Mansfield.
Trade of Amoy for the year 1899. Foreign Office, Annual No. 2502, 1900.
Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 14. Price 1d.
- China—Chifu.** Tratman.
Trade of Chefoo for the year 1899. Foreign Office, Annual No. 2478, 1900.
Size 10×6 , pp. 10. Price 1d.
- China—Chinkiang.** Willis.
Trade of Chinkiang for the year 1899. Foreign Office, Annual No. 2469, 1900.
Size $10 \times 6\frac{1}{2}$, pp. 12. Price 1d.
- China—Historical.** *Fortnightly Rev.* 68 (1900): 372-390, 601-617. Gordon.
Gordon's Campaign in China, by Himself. With an Introduction and Short Account of the Tai-ping Rebellion, by Colonel R. H. Vetch, C.B. *With Sketch-maps.*
- China—Kiauchou.** *Ann. Hydrographie* 28 (1900): 401-405. —
Kiautschou.
- China—Kiukiang.** Brady.
Trade of Kinkiang for the year 1899. Foreign Office, Annual No. 2500, 1900.
Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 16. Price 1d.
- China—Kiungchow.** Butler.
Trade of Kiungchow for the year 1899. Foreign Office, Annual No. 2501, 1900.
Size $9\frac{1}{2} \times 6$, pp. 14. Price 1d.
- China—Manchuria.** Fulford.
Trade of Newchwang for the year 1899. Foreign Office, Annual No. 2499, 1900.
Size $9\frac{1}{2} \times 6$, pp. 12. Price 1d.
- China—Manchuria.** *National G. Mag.* 11 (1900): 326-327. —
Railways, Rivers, and Strategic Towns in Manchuria.
- China—Medical Reports.** —
China. Imperial Maritime Customs. II. Special Series. No. 2. Medical Reports, for the half-year ended 30th September, 1899. Shanghai: Kelly & Walsh; London: P. S. King & Son. 1900. Size 11×9 , pp. vi. and 78. *Maps. Presented by the Inspector-General of Chinese Customs.*
Includes a paper, in French, by Dr. J. J. Matignon, on the bubonic plague in Mongolia. There are also the usual meteorological tables.
- China—Pe-chi-li Gulf.** *Ann. Hydrographie* 28 (1900): 337-363. —
Der Golf von Petschili. Der Zugang zum Golf von Petschili.
- China—Samshui.** Little.
Trade of Samshui for the year 1899. Foreign Office, Annual No. 2467, 1900.
Size $10 \times 6\frac{1}{2}$, pp. 14. Price 1d.
- China—Tibet.** *Petermanns M.* 46 (1900): 166-167. Singer.
Rakas-Tal und Manasarowar. Von H. Singer.
A review of Sir Richard Strachey's paper in the *Journal*. Suggests that the outflow from the Manasarowar lake is intermittent, like that from Lake Tanganyika, depending on the level of the water as affected by a succession of wet or dry seasons.
- China—Tientsin.** Carles.
Trade of Tientsin for the year 1899. Foreign Office, Annual No. 2487, 1900.
Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 18. *Map.* Price 3d.
- China—Wuhu.** Mortimore.
Trade of Wuhu for the year 1899. Foreign Office, Annual No. 2457, 1900.
Size 10×6 , pp. 12. Price 1d.
- China—Yangtse-Kiang.** *Ann. Hydrographie* 28 (1900): 405-428. —
Die Mündung des Yangtse-Kiang.
- China Seas.** *B.S.G. Lille* 33 (1900): 408-418; 34 (1900): 42-52, 105-114. —
En Croisière—Deux ans dans les mers de Chine.
- Eastern Asia.** *Ann. Hydrographie* 28 (1900): 428-434. Schott.
Die Strömungen zwischen Singapore und Taku. Von Dr. G. Schott. *With Charts.*
On the ocean currents on the coast of Indo-China and China.

French Indo-China.

Tremlett.

Trade of French Indo-China for the year 1899. Foreign Office, Annual No. 2485, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 8. Price $\frac{1}{2}$ d.

India—Ancient monuments. *P. Asiatic S. Bengal* (1900): 56-65.

Curzon.

Ancient Monuments in India. By His Excellency Baron Curzon of Kedleston.

India—Bombay.*P.R.S. Edinburgh* 22 (1897-99): 11-21.

Moos.

A Short Note on the Disturbance of the Magnetical and Meteorological Instruments at the Colaba Observatory during the Earthquake of 12th June, 1897. By N. A. Moos. With Illustrations.

India—Goa.

Pemberton.

Trade of Goa for the year 1899. Foreign Office, Annual No. 2461, 1900. Size $10 \times 6\frac{1}{2}$, pp. 8. Price $\frac{1}{2}$ d.

India—Himālaya.

Workman.

In the Ice World of Himālaya. Among the Peaks and Passes of Ladakh, Nubra, Suru, and Baltistan. By Fanny Bullock Workman and William Hunter Workman. London: T. Fisher Unwin, 1900. Size 9×6 , pp. xvi. and 204. Maps and Illustrations. Price 16s. Presented by the Publisher.

An account of a mountaineering trip in 1899, in the course of which part of the Karakoram range explored by Sir Martin Conway was revisited and some new ascents made.

India—Historical.*J. Asiatique* 15 (1900): 297-341, 401-468.

Lévi.

Les missions de Wang Hiu-en-ts'e dans l'Inde. Par M. Sylvain Lévi.

India—Languages.*J.E. Asiatic S.* (1900): 501-510.

Grierson.

On the Languages spoken beyond the North-Western Frontier of India. By George A. Grierson. With Map.

India—Map.

Gore.

Survey of India Department. Professional Paper, No. 1. On the Projection for a Map of India and adjacent countries on the Scale of 1:1,000,000. By Colonel St. G. C. Gore. Dehra Dun, 1900. Size $11 \times 8\frac{1}{2}$, pp. 6. Index Map.

Noted in the *Journal*, ante, p. 473.

India—Punjab.*P.I. Civil Engineers* 140 (1900): 130-142.

Farrell.

Railway Flood-Works in the Punjab and Sind, relative to the North-Western State Railway. By R. C. Farrell. With Plate and Diagrams.

India—Punjab Gazetteers.

Gazetteer of the Peshawar District, 1897-98. Compiled and Published under the authority of the Punjab Government. Pp. xiv., 392, and xlvi. Gazetteer of the Kangra District. Parts ii.-iv. Kulu, Lakul, and Spiti. 1897. Pp. xii., 152, and 126. Gazetteer of the Montgomery District. By P. J. Fagan. 1898-99. Revised Edition. Pp. xii., 240, and lvi. Lahore [1898]-1900. Size 10×7 . Maps. Presented by the Secretary of State for India.

India—Shan States.

Middlemiss.

Report on a Geological reconnaissance in parts of the Southern Shan States and Karenni. By C. S. Middlemiss.—General Report, Geological Survey of India, 1899-1900, pp. 122-153.

India—Shan States.

La Touche.

Preliminary Report on the Geology of the Northern Shan States. By T. D. La Touche.—General Report, Geological Survey of India, 1899-1900, pp. 74-95.

India—Survey Report.

General Report on the Operations of the Survey of India Department administered under the Government of India during 1898-99. Prepared under the direction of Colonel St. G. C. Gore. Calcutta, 1900. Size $13 \times 8\frac{1}{2}$, pp. vi., 100, and lviii. Portrait and Maps.

India—Upper Burma.

Dutta.

Notes on the Geology of the Country along the Mandalay-Kunlon Ferry Railway route, Upper Burma. By P. N. Dutta.—General Report, Geological Survey of India, 1899-1900, pp. 96-122. Section.

Japan.

Lay.

Trade of Japan for the year 1899. Foreign Office, Annual No. 2397, 1900. Size 10×6 , pp. 48. Price $2\frac{1}{2}$ d.

- Japan—Bamboo Cultivation.** *T. Asiatic S. Japan* 27 (1899): 128. **Satow.**
The Cultivation of Bamboos in Japan. By Sir Ernest Satow, K.C.M.G. *With Illustrations.*
- Japan—Earthquakes.** _____
Publications of the Earthquake Investigation Committee in Foreign Languages.
No. 4. Tōkyō, 1900. Size 10 × 7½, pp. 142. *Plates.*
Notes on earthquakes in Japan during 1891 and 1894, with descriptions of methods of building which resist the effects of shocks.
- Japan—Yokohama.** **Bonar.**
Trade of Yokohama for the year 1899. Foreign Office, Annual No. 2444, 1900. Size 10 × 6½, pp. 24. *Price 1½d.*
- Malay Archipelago—Borneo.** **Hose.**
In the Heart of Borneo. By Charles Hose. (From the *Geographical Journal* for July, 1900.) Size 10 × 6½, pp. 24. *Map and Illustrations.*
- Malay Archipelago—Java.** **David.**
Trade of Java for the year 1899. Foreign Office, Annual No. 2452, 1900. Size 10 × 6, pp. 20. *Price 1½d.*
- Malay States—Selangor.** *P.I. Civil Engineers* 140 (1900): 143-153. **Fox.**
Selangor Government Railway. By G. H. Fox. *With Plate.*
- Persia, etc.** *J. Bombay Br. R. Asiatic S.* 20 (1899): 156-190. **Modi.**
The Cities of Irān as described in the old Pahlavi treatise of Shatrōiha-i-Irān. By Jivanji Jamshedji Modi.
- Persian Gulf.** **Meads.**
Trade of the Persian Gulf for the year 1899. Foreign Office, Annual No. 2442, 1900. Size 10 × 6, pp. 3. *Price 2d.*
- Philippines.** *M.G. Ges. Wien* 43 (1900): 87-100. **Blumentritt.**
Die Igorroten von Pangasinan. Nach den Mittheilungen des Missionärs P. Fr. Mariano Rodriguez. Bearbeitet von F. Blumentritt.
Sketch of a pagan tribe in the interior of Luzon.
- Philippines.** **Harford.**
Trade of the Philippine Islands for the year 1899. Foreign Office, Annual No. 2436, 1900. Size 10 × 6½, pp. 20. *Price 1½d.*
- Russian Armenia.** *M.G. Ges. Hamburg* 16 (1900): 1-15. **Friederichsen.**
Russisch Armenien und der Ararat. Von Dr. Max Friederichsen. *With Sketch-map and Plate.*
- Russia—Siberia.** *B. American G.S.* 32 (1900): 260-263. **Olasuffjev.**
The Territory of Anadyr. (From the Russian of E. Olasuffjev, by E. Bondy.)
- Russia—Siberia.** *Oester. Monats. Orient* 26 (1900): 66-70. _____
Die geschichtliche Entwicklung Sibiriens.
- Siam.** **McCarthy.**
Surveying and Exploring in Siam. By James McCarthy. London: John Murray, 1900. Size 8½ × 3½, pp. xii. and 216. *Maps and Illustrations.* *Price 10s. 6d. net.*
This is one of the additional publications of the Royal Geographical Society, and records the experiences of Mr. McCarthy in carrying out the survey of Siam. It is illustrated by several admirable maps engraved on copper at the expense of the Siamese Government, numerous photographs, and some pen-and-ink sketches by Mr. H. Warrington Smyth.
- Sinai Peninsula.** *Le Globe. B.S.G. Genre* 39 (1900): 75-84. **Keller.**
Voyage au mont Sinai. Par M. Ad. Keller.
- Turkey.** **Sachau.**
Am Euphrat und Tigris. Reisenotizen aus dem Winter 1897-1898. Von Eduard Sachau. Leipzig: J. C. Hinrichs, 1900. Size 8½ × 6, pp. 100. *Maps and Illustrations.* *Price 5m.*
Record of a journey, apparently carried out mainly for archaeological purposes, up the Tigris from the Persian gulf to Mosul, and thence across by the Euphrates to Aleppo.

Turkey.**Verney and Dambmann.**

Les puissances étrangères dans le Levant en Syrie et en Palestine. Par MM. Noël Verney et George Dambmann. Préface de M. Lortet. Paris: Guillaumin et C^e, 1800. Size 12 × 8½, pp. xxiv. and 794. *Maps. Price 40 fr. Presented by the Publishers.*

This huge volume deals systematically with six aspects of public life in the Levant—politics, finance, public works, agriculture, industry, and trade—estimating the part played by each of the great European powers. The work is excellently got up, the statistics clearly arranged and reduced to uniform units, and there are several indexes, making the whole easy of reference.

Turkey—Armenia.*M.G. Ges. Hamburg* 16 (1900): 16–70.**Belek and Lehmann.**

Reisebriefe von der Armenischen Expedition der Herren Dr. W. Belck und Dr. C. F. Lehmann.

Turkey—Palestine. *Palestine Explor. Fund, Quarterly Statement* (1900): 273–282. **Hill.**

The Dead Sea. By Gray Hill.

See note, *ante*, p. 555.

Turkey—Syria.**Drummond-Hay.**

Trade of Beirut and Coast of Syria for the year 1899. Foreign Office, Annual No. 2441, 1900. Size 9½ × 6, pp. 22. *Price 1½d.*

Western Asia.**Barthold.**

Russische Arbeiten über Westasien. Jahresbericht [für 1897—ditto für 1898]. Von W. Barthold.—Mittheilungen des Seminars für Orientalische Sprachen an der Universität zu Berlin. Jahrgang I., II., 2 Abt. pp. 150, 171; 2 Abt. pp. 83–104. Berlin and Stuttgart: W. Spemann, 1898, 1899. Size 10 × 7.

A summary of the geographical, archæological, and linguistic work described by Russian writers in 1897 and 1898.

AFRICA.**Abyssinia.***Mouvement G.* 17 (1900): 433–436.

Les provinces équatoriales d'Abyssinie (d'Adis-Abeba au lac Rodolphe).

Refers to the expedition of Count Leontieff to Lake Rudolf.

Abyssinia.*La G., B.S.G. Paris* (1900): 105–118.**Léontieff.**

Exploration des provinces équatoriales d'Abyssinie. Par le Comte N. de Léontieff. *With Map and Illustrations.*

See note in *Journal*, *ante*, p. 558.

Africa—Exploration.*Deutsche Rundschau G.* 22 (1900): 552–561.**Lenz.**

Fortschritte der geographischen Forschungen und Reisen im Jahre 1899. 4. Afrika. Von Oskar Lenz.

Africa—Exploration.*Riv. G. Italiana* 7 (1900): 335–352.**Porena.**

Le scoperte geografiche del Secolo XIX. del Prof. Filippo Porena. II. Scoperte in Africa.

Algeria.**Hay-Newton.**

Trade of Algeria for the year 1899. Foreign Office, Annual No. 2472, 1900. Size 10 × 6, pp. 38. *Price 2½d.*

Algeria—Atlas.*Jahrb. Schweiz. Alpenclub* 35 (1899–1900): 142–156.**Zeller.**

Aus dem algerischen Atlasgebirge. (Cedernpik und Dachebel Metlili.) Von Dr. R. Zeller. *With Illustrations.*

British Central Africa. *Verh. Ges. Erdk. Berlin* 27 (1900): 332–338.**Fülleborn.**

Ueber Untersuchungen im Nyassa-See und in den Seen im nördlichen Nyassa-Land. Von Dr. F. Fülleborn. *With Map and Diagrams.*

A note on this paper appears in the *Journal*, *ante*, p. 561.

Central Africa.*La G., B.S.G. Paris* (1900): 119–122.**Foa.**

Coupe de l'Afrique équatoriale du sud-est au nord-ouest (Zambèze-Congo). Par M. Edouard Foa. *With Illustrations.*

The paper is accompanied by sketches by the author, and a profile showing the relative elevation of the country along a line from the mouth of the Zambezi to that of the Congo, following the course of the latter river.

Central Africa.

Sharpe and Gray.

Commissioner Sharpe to the Marquess of Salisbury. (No. 28. Central Africa.) (Tanganyika and Mweru districts.)

Account by Dr. D. Gray of a journey from Zomba to Kazembe's, from thence up the Luapula river a short distance, and back through the northern part of the great Mweru marsh, thence back to Zomba *via* Sumbu and Abercorn. (1900.) Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 12. [Not published.]

Extracts from official reports.

Congo.*Mouvement G.* 17 (1900): 337-339.

[Wauters]

Les sources du Congo. Par A. J. W.

Arguments that the Lubudi is the chief source of the Congo.

Congo State.*Questions Dipl. et Colon.* 10 (1900): 156-167.

Anton

La régime foncier dans l'État indépendant du Congo. Par le Dr. G. K. Anton.

East Africa.Africa. No. 3 (1900). Correspondence respecting Slavery and the Slave Trade in East Africa and the Islands of Zanzibar and Pemba. London: Eyre & Spottiswoode, 1900. Size $13 \times 8\frac{1}{2}$, pp. 22. Price 3d.**East Africa.***J. Anthropol.* 1. 29 (1899): 226-247.

Macdonald

Notes on the Ethnology of Tribes met with during progress of the Juba Expedition of 1897-99. By Lieut.-Colonel J. R. L. Macdonald. *With Maps.***Egypt.***C. Rd.* 131 (1900): 401-403.

Depéret and Fourtau

Sur les terrains néogènes de la Basse-Égypte et de l'isthme de Suez. Note de MM. C. Depéret et R. Fourtau.

On the Miocene and Pliocene deposits of Northern Egypt.

Egypt—Suez Canal.*P.I. Civil Engineers* 141 (1900): 157-212.

Hartley

A short history of the Engineering Works of the Suez Canal. By Sir Charles Hartley, K.C.M.G. *With Diagrams.***Egyptian Sudan.***La G., B.S.G. Paris* (1900): 25-34.

Michel

Résultats géographiques de la mission de Bonchamps. Par M. Ch. Michel. *With Map and Illustrations.*This is referred to in the *Journal* for October, p. 476.**French Congo—Niari.***La G., B.S.G. Paris* (1900): 161-166.

Chatelier.

Le Bassin minier du Niari. Par M. A. Le Chatelier. *With Maps.***French Sudan.***La G., B.S.G. Paris* (1900): 9-24.

Baillaud.

Les territoires français du Niger, leur valeur économique. Par M. E. Baillaud. *With Map and Illustrations.*This is referred to in the *Journal* for October, p. 477.**German East Africa.***M. Deutsch. Schutzgeb.* 13 (1900): 240-264.

Kaudt.

Bericht über meine Reisen und gesammte Thätigkeit in Deutsch-Ostafrika. Von Dr. Richard Kaudt.

See note, *ante*, p. 559.**German East Africa.***M. Deutsch. Schutzgeb.* 13 (1900): 189-240.

Maurer.

Resultate aus den Aufzeichnungen meteorologischer Registrirapparate in Deutsch-Ostafrika aus der Zeit von Ende 1895 bis Ende 1899. Von Dr. H. Maurer. *With Diagram.*

On the readings of recording meteorological instruments in German East Africa.

German South-West Africa.*M. Deutsch. Schutzgeb.* 13 (1900): 185-188.

Eggers.

Bericht über eine Reise nach dem Okavangogebiet. Von Leutnant Eggers.

See note, *ante*, p. 561.**German West Africa—Adamaua.***Kolon. Z.* 1 (1900): 214-216.Land und Leute an der Südgrenze Westadamauas. *With Map and Illustrations.***Ivory Coast.***B.S.G. Lille* 34 (1900): 75-98.

Houdaille.

Le port et le chemin de fer de la Côte d'Ivoire. Par le Commandant Houdaille. *With Map.***Kamerun.***Vehr. Ges. Erdk. Berlin* 27 (1900): 272-285.

Esch.

Herr Dr. Ernst Esch: Ueber das Küstengebiet von Kamerun, auf Grund zweijähriger Reisen.

Madagascar.

Boegner and Germond.

Rapport sur la Délégation à Madagascar de MM. Alf. Boegner et Paul Germond (Juillet 1898—Février 1899). Avec un Appendice. Paris: Maison des Missions Évangéliques, 1899. Size $10 \times 6\frac{1}{2}$, pp. 278. *Map and Illustrations*. Price 3s. 9d.

An account of the visit of a delegation from the French Protestant Missionary Society to Madagascar, with reports on the various Christian missions, both French and foreign, in that country.

Madagascar.

Gouvernement Général de Madagascar et Dépendances. Guide de l'Immigrant à Madagascar, publié par la Colonie avec le concours du Comité de Madagascar. 3 vols. and Atlas. Tome i. Histoire, Géographie, Organisation administrative. (Pp. xvi. and 410.) Tome ii. Productions, Industrie, Commerce, Cultures, Colonisation. (Pp. x. and 588.) Tome iii. Voies de Communication, Hygiène, Documents officiels, Législation. (Pp. vi. and 440.) Paris: A. Colin & Co^{ie}, 1899. Size $10 \times 6\frac{1}{2}$. *Illustrations*. Atlas, size 14×11 . Price 40 fr.

The most comprehensive and authoritative work on Madagascar published since the annexation.

Madagascar.

La G., B.S.G. Paris (1900): 183-198.

Les études géographiques à Madagascar.

A sketch of the geographical exploration and cartographical work accomplished in Madagascar since the French annexation.

Morocco.

La G., B.S.G. Paris (1900): 167-182.

Delbrel.

De Fez à l'Oranie à travers le pays des Ghiata (vallée de l'Inaoun), 1899. Par M. G. Delbrel. *With Map*.

Morocco.

Blackwood's Mag. 168 (1900): 1-12.

Harris.

The Morocco Scare. By Walter B. Harris.

The author considers that France has preponderating rights in Morocco, and that, with certain safeguards to the rights of others, there is no reason why she should not possess the country.

Nigeria. Church Miss. Intelligencer 51 (1900): 675-689. Tugwell and Richardson.

The Expedition to Hausaland. Letters from Bishop Tugwell, and Narrative of the Rev. A. E. Richardson.

An interesting account of a missionary journey to Kano.

North-East Africa.

Erlanger and Neumann.

Verh. Ges. Erdk. Berlin 27 (1900): 285-288.

Herr Carlo v. Erlanger und Herr Oskar Neumann, über ihre Reise in Nordost-Afrika.

Portuguese East Africa—Beira.

McMaster.

Trade of Beira for the year 1899. Foreign Office, Annual No. 2427, 1900. Size 10×6 , pp. 18. Price $1\frac{1}{2}$ d.

Portuguese East Africa—Chinde.

MacDonell.

Trade of Chinde for the year 1899. Foreign Office, Annual No. 2495, 1900. Size $9\frac{1}{2} \times 6$, pp. 12. Price 1d.

Somaliland.

Scottish G. Mag. 16 (1900): 467-490.

Koettlitz.

A Journey through Somaliland and Southern Abyssinia to the Shangalla or Berta Country and the Blue Nile, and through the Sudan to Egypt. By Reginald Koettlitz. *With Illustrations*.

Somaliland and Abyssinia. Scottish G. Mag. 16 (1900): 490-493.

Omond.

Temperature Observations in Somaliland and Abyssinia. By R. T. Omond.

South Africa.

McCormick.

Two Thousand Miles through South Africa; or, the Transvaal from Without. By Rev. W. T. McCormick. London: C. J. Thynne, 1900. Size $8 \times 5\frac{1}{2}$, pp. xii. and 142. *Map and Illustrations*. Price 2s. 6d. *Presented by the Author*.

The basis of this work is a visit to South Africa in 1886, but it contains historical references and supplementary notes as to recent occurrences.

Sudan Language.

Kampffmeyer.

Material zum Studium der arabischen Beduinendialekte Innerafrikas. Von G. Kampffmeyer.—Mittheilungen des Seminars für Orientalische Sprachen an der Universität zu Berlin. Jahrgang ii. 2 Abt. pp. 143-221. Berlin and Stuttgart: W. Spemann, 1899. Size 10×7 .

On the dialects of the Arabs in the Sudan.

No. V.—NOVEMBER, 1900.]

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- Togo.** Plehn.
Beiträge zur Völkerkunde des Togo-Gebietes, von R. Plehn.—Mittheilungen des Seminars für Orientalische Sprachen an der Universität zu Berlin. Jahrgang II 3 Abt. pp. 87-124. Berlin and Stuttgart: W. Spemann, 1899. Size 10 × 7. *Map and Illustrations.*
- Transvaal and Abyssinia.** *B.S.G. Marseille* 24 (1900): 31-53. Orléans.
Le Transvaal et l'Abyssinie, conférence de M. le Prince Henri d'Orléans.
Mainly concerned with British and French rivalry in Africa.
- Tripoli.** Dickson.
Trade of Tripoli for the year 1899. Foreign Office, Annual No. 2453, 1900. Size 10 × 6, pp. 8. Price ½d.
- West Africa.** *A travers le Monde, Tour du Monde* 6 (1900): 229-230. ———
La délimitation franco-espagnole en Afrique. *With Map.*
- West Africa—Lake Chad.** *B. Comité l'Afrique Française* 10 (1900): 162-165. ———
Autour du lac Tchad. *With Map.*
On the three recent French missions to Lake Chad.

NORTH AMERICA.

- Canada.** ———
Annual Report of the Department of the Interior for the year 1899. Ottawa, 1900. Size 10 × 6½, pp. viii., xxxviii., 112, 238, 12, 100, 78, 10, and 20. *Maps (separate) and Illustrations.*
See note, *ante*, p. 563.
- Canada—Minerals.** ———
Paris International Exhibition, 1900. Descriptive Catalogue of a collection of the Economic Minerals of Canada. Printed by direction of the Canadian Commission for the Exhibition. Size 9½ × 6½, pp. xxxii. and 218.
- Canada—Ontario.** *T. Canadian I.* 6 (1899): 29-44. Coleman.
The Iroquois Beach. By Prof. A. P. Coleman, PH.D. *Maps.*
Discusses the northern limit of the great Iroquois Lake which formed the raised beaches in the neighbourhood now occupied by Toronto.
- Canada—Tides and Currents.** Dawson.
Survey of Tides and Currents in Canadian Waters. Report of Progress. By W. Bell Dawson. Ottawa, 1900. Size 10 × 6½, pp. 20.
- Lake Superior.** *T. Canadian I.* 6 (1899): 45-60. Bell.
The Geological History of Lake Superior. By Dr. Robert Bell, F.R.S.
A sketch of the development of the hollow occupied by Lake Superior, based on geological considerations.
- Mexico.** *Kolon Z.* 1 (1900): 244-246. ———
Das Deutschtum in Mexiko. *With Portrait.*
- Mexico.** *P.R. Dublin S.* 9 (1899): 60-75. Doyle.
The Rio Del Fuerte of Western Mexico, and its Tributaries. By Kinsley Dryden Doyle. *With Map and Plates.*
Exploration and survey of one of the Mexican river-basins, illustrated by an original map and several sketches.
- Mexico—Huichol Indians.** Lumholtz.
Memoirs of the American Museum of Natural History. Vol. iii. Anthropology. II. 1. Symbolism of the Huichol Indians. By Carl Lumholtz. May, 1900. Size 14 × 11½, pp. 228. *Maps and Illustrations. Presented by the Museum.*
- Mexico—Sonora.** Jerome.
Trade and Agriculture of the State of Sonora. Foreign Office, Annual No. 2464, 1900. Size 10 × 6½, pp. 18. Price 1½d.
- North America—Geology.** *J. Geology* 8 (1900): 241-273. Logan.
A North American Epicontinental Sea of Jurassic Age. By W. N. Logan. *Maps.*
- United States—Colorado.** *National G. Mag.* 11 (1900): 337-351. Barrows.
The Colorado Desert. By David P. Barrows. *With Map and Illustrations.*

- United States—Colorado.** *J. Geology* 8 (1900): 214-240. **Mathews.**
The Granitic Rocks of the Pikes Peak Quadrangle. By Edward B. Mathews.
With Sketch-map and Illustrations.

- United States—Illinois.** **Baker.**
The Chicago Academy of Sciences. The Mollusca of the Chicago Area. The
Pelecypoda. By Frank Collins Baker. Bulletin No. iii. Part i. of the Natural
History Survey. Issued September 1, 1898. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 130. *Map and*
Plates. Presented by the Chicago Academy of Sciences.

- United States—Kansas.** *B.U.S. Geolog. Surv.*, No. 154 (1898): 1-246. **Gannett.**
A Gazetteer of Kansas. By H. Gannett. *With Maps.*

This is a full geographical description of Kansas, as well as a list of the inhabited places in the state. The maps show the configuration, the density of population at different censuses, and the climatic conditions. The isotherms of mean annual temperature show a steady increase from 53° in the north to 57° in the south, and the rainfall map shows an equally uniform falling-off of rain from 35 inches in the east to 15 inches in the west.

- United States—Maine.** **Stone.**
The Glacial Gravels of Maine and their Associated Deposits. By George H. Stone.
(Monographs of the United States Geological Survey. Vol. xxxiv.) Washington,
1899. Size $12 \times 9\frac{1}{2}$, pp. xii. and 500. *Maps and Illustrations. Presented by the*
U.S. Geological Survey.

- United States—Massachusetts.** **Stuart.**
Trade of Boston for the year 1899. Foreign Office, Annual No. 2476, 1900. Size
 10×6 , pp. 30. *Price 2d.*

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The Geology of Eastern Berkshire County, Massachusetts. By B. K. Emerson.
With Maps and Illustrations.

- United States—Meteorology.** **Frankenfield.**
Vertical Gradients of Temperature, Humidity, and Wind Direction. A Preliminary
Report on the Kite Observations of 1898. Prepared . . . by H. C. Frankenfield.
—U.S. Department of Agriculture, Weather Bureau. Bulletin F. Washington,
1899. Size $12 \times 9\frac{1}{2}$, pp. 72. *Plates and Diagrams. Presented by the U.S.*
Weather Bureau.

- United States—Michigan.** **Clements and Smyth.**
The Crystal Falls Iron-bearing District of Michigan. By J. Morgan Clements and
Henry Lloyd Smyth, with a Chapter on the Sturgeon River Tongue, by William
Shirley Bawley, and an Introduction by Charles Richard Van Hise. (Monographs
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Size $12 \times 9\frac{1}{2}$, pp. xxxvi. and 512. *Maps and Illustrations. Presented by the U.S.*
Geological Survey.

- United States—Michigan.** *American J. Sci.* 10 (1900): 158-160. **Mudge.**
Further Notes on Preglacial Drainage in Michigan. By E. H. Mudge.

- United States—Minnesota.** *B.U.S. Geolog. Surv.*, No. 157 (1899): 1-160. **Hall.**
The Gneisses, Gabbro-Schists, and Associated Rocks of South-Western Minnesota.
By C. W. Hall. *With Maps and Illustrations.*

- United States—Mississippi.** *J. Franklin I.* 150 (1900): 1-17. **Haupt.**
The Reaction Breakwater as Proposed for the Opening of the South-west Pass of
the Mississippi River. By Lewis M. Haupt. *With Illustrations.*
See note in *Journal* for October, ante, p. 477.

- United States—Missouri.** **White.**
Fossil Flora of the Lower Coal Measures of Missouri. By David White. (Mono-
graphs of the United States Geological Survey. Vol. xxxvii.) Washington, 1899.
Size $12 \times 9\frac{1}{2}$, pp. x. and 468. *Plates. Presented by the U.S. Geological Survey.*

- United States—Narragansett Basin.** **Shaler, Woodworth, and Foerste.**
Geology of the Narragansett Basin. By N. S. Shaler, J. B. Woodworth, and A. F.
Foerste. (Monographs of the United States Geological Survey. Vol. xxxiii.)
Washington, 1899. Size $12 \times 9\frac{1}{2}$, pp. xx. and 402. *Map and Illustrations. Pre-*
sented by the U.S. Geological Survey.

- United States—Nebraska.** *J. Geology* 8 (1900): 309-312. Barbour.
 Glacial Grooves and Striae in South-Eastern Nebraska. By E. H. Barbour.
- United States—South Dakota.** *B.U.S. Geolog. Surv.*, No. 158 (1899): 1-172. Todd
 The Moraines of South-Eastern South Dakota and their Attendant Deposits. By J. E. Todd. *With Maps and Illustrations.*
- United States—Weather Bureau.** Bigelow.
 Work of the Meteorologist for the Benefit of Agriculture, Commerce, and Navigation. By F. H. Bigelow.—Year-book of the United States Department of Agriculture, 1899. Washington, 1900. Size $9\frac{1}{2} \times 6$, pp. 71-92. *Illustrations. Presented by the U.S. Department of Agriculture.*
 A history of the Weather Bureau of the United States, and an account of the work carried on by it.
- United States—Yellowstone National Park.** Hague and others.
 Geology of the Yellowstone National Park. Part ii. Descriptive Geology, Petrography, and Paleontology. By Arnold Hague, J. P. Iddings, W. H. Weed, and C. D. Walcott, G. H. Girty, T. W. Stanton, and F. H. Knowlton. (Monographs of the United States Geological Survey. Vol. xxxii. Part ii.) Washington, 1899. Size $12 \times 9\frac{1}{2}$, pp. xviii. and 894. *Illustrations. Presented by the U.S. Geological Survey.*

CENTRAL AND SOUTH AMERICA.

- Argentine Republic.** *B.S.G. Madrid* 42 (1900): 49-59. Bavio.
 La Llanura argentina. Por D. Ernesto A. Bavio.
 On the great Argentine plain.
- Argentine Republic.** Clarke.
 Agricultural and Commercial Condition of Argentine Republic for the year 1899. Foreign Office, Annual No. 2479, 1900. Size 10×6 , pp. 12. *Price 1d.*
- Argentine Republic—Buenos Ayres.** Hankin.
 Trade of Consular District of Buenos Ayres for the year 1899. Foreign Office, Annual No. 2480, 1900. Size 10×6 , pp. 26. *Price 2d.*
- Bolivia.** Ballivian and Saavedra.
 Monografías de la Industria Minera. III. El Estaño en Bolivia seguido de un Apéndice y de Apuntes sobre el bismuto. Por Manuel V. Ballivian y Bautista Saavedra. La Paz, 1900. Size $9 \times 6\frac{1}{2}$, pp. 136. *Presented by Don M. V. Ballivian.*
 On the tin-mines of Bolivia.
- Bolivia—Andes.** Ballivián.
 Estudios de orografía Andina. Exploraciones y ascenciones de Sir Martin Conway en los Andes de Bolivia, seguidas de las observaciones sobre medidas hipsométricas por Mr. Adolfo F. Bandelier. Compiladas, traducidas y precedidas de una Introducción por Manuel Vicente Ballivián. La Paz, 1900. Size 9×7 , pp. xviii. and 76. *Presented by the Translator.*
- Brazil.** Goeldi.
 Memórias do Museu Paraense de Historia Natural e Ethnographia. 1. Excavações archeologicas em 1895 executadas pelo Museu Paraense no Littoral da Guyana Brasileira entre Oyapock e Amazonas. 1ª. Parte. As cavernas funerarias artificiaes de Indios hoje extinctos no Rio Cunany (Goanany) e sua ceramica. Pelo Dr. Emilio A. Goeldi. Pará, 1900. Size $12\frac{1}{2} \times 9$, pp. 46. *Plates. Presented by the Museum.*
- Brazil—Amazonas.** Temple.
 State of Amazonas. Foreign Office, Miscellaneous, No. 530, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 44. *Price 2½d.*
- Brazil—Bahia.** Nicolini.
 Trade of Bahia for the year 1899. Foreign Office, Annual No. 2470, 1900. Size $10 \times 6\frac{1}{2}$, pp. 14. *Price 1d.*
- Brazil—Rio de Janeiro.** Rhind.
 Trade of Rio de Janeiro for the year 1899. Foreign Office, Annual No. 2475, 1900. Size $10 \times 6\frac{1}{2}$, pp. 58. *Price 3d.*

- Central America.** *Petermanns M.* 46 (1900): 149-161. **Sapper.**
Bemerkungen über einige Vulkane von Guatemala und Salvador. Von Dr. Carl Sapper. *With Map.*

This paper is noticed in the *Journal* for October, p. 478.

- Central America—Inscriptions.** *T. Canadian I.* 6 (1899): 101-244. **Campbell.**
Decipherment of the Hieroglyphic Inscriptions of Central America. By John Campbell, LL.D. *With Sketch-map and Illustrations.*

Dr. Campbell explains his method of treating the Mexican inscriptions as pure ideographs similar to the Chinese, and he presents a translation of some of the Palenque tablets based on this system.

- Chile.** **Cusaack-Smith.**
Trade of Chile for the year 1899. Foreign Office, Annual No. 2481, 1900. Size 10 × 6, pp. 54. *Price* 3d.

- Chile—Railways.** **Jiménez.**
An. S. Ci. Argentina 49 (1900): 97, 145, 219, 256: 50 (1900): 14.
Los ferrocarriles de Chile. Por Juan Velazquez Jiménez. *With Maps.*

- Cuba.** **Carden.**
Trade of Cuba for the year 1899. Foreign Office, Annual No. 2473, 1900. Size 10 × 6, pp. 28. *Price* 2d.

- Ecuador—Quito.** *C. Rd.* 130 (1900): 1740-1742. **Leygues.**
M. le Ministre de l'Instruction Publique adresse à l'Académie une Lettre relative à une nouvelle mesure de l'arc du méridien de Quito.
See note in *Journal* for September, p. 356.

- Ecuador—Quito.** *La G., B.S.G. Paris* (1900): 1-8. **Maurain.**
Reconnaissance de l'arc du méridien de Quito. Par M. E. Maurain. *With Map and Illustrations.*
This is referred to in the *Journal* for September, p. 356.

- French West Indies.** **Japp.**
Trade of Martinique for the year 1899. Foreign Office, Annual No. 2494, 1900. Size 9½ × 6½, pp. 10. *Price* 1d.

- Guatemala.** **Trayner.**
Trade, Agriculture, and Finance of Guatemala for the year 1899. Foreign Office, Annual No. 2488, 1900. Size 10 × 6½, pp. 44. *Price* 2½d.

- Honduras.** **Campbell.**
Trade of Honduras for the year 1899. Foreign office, Annual No. 2463, 1900. Size 10 × 6½, pp. 10. *Price* 1d.

- Nicaragua Canal.** *National G. Mag.* 11 (1900): 363-365. **Davis.**
The Water Supply for the Nicaragua Canal. By Arthur P. Davis.
Controversy Prof. Heilprin's arguments as to the sinking level of Lake Nicaragua.

- Patagonia—Andes.** *Z. Ges. Erdk. Berlin* 35 (1900): 77-126. **Krüger.**
Die chilensische Reñihue-Expedition. Ein Beitrag zur Erforschung der Patagonischen Anden. Von Dr. Paul Krüger. *With Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

- Australasia.** **Wragge.**
Wragge's Australasian Almanac and Weather Guide for Land and Sea. 1900. Brisbane: Sapsford & Co. Size 7½ × 5, pp. 358. *Charts and Illustrations.* *Price* 2s. 6d. *Presented by Messrs. Gordon & Gotch.*

- German New Guinea.** *Deutsch. Kolonialblatt* 11 (1900): 630-637.
Bericht über eine Bereisung Neu-Mecklenburgs durch den Kaiserlichen Gouverneur und Prof. Dr. Koch.

- Hawaii.** **Hoare.**
Trade of Hawaiian Islands for the year 1899. Foreign Office, Annual No. 2492, 1900. Size 10 × 6½, pp. 12. *Price* 1d.

- New South Wales.**
New South Wales. Statistics, History, and Resources. Compiled by the Editor of the Year-Book of Australia for circulation by the Agent-General in London.

1900. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 166. *Map. Presented by the Agent-General for New South Wales.*
- New South Wales.** Rae, Pittman, and David.
J. and P.R.S. New South Wales 33 (1899): 207-224.
 Records of Rock Temperatures at Sydney Harbour Colliery, Birthday Shaft, Balmain, Sydney, N.S. Wales. By J. L. C. Rae, E. F. Pittman, and Prof. T. W. E. David.
- New South Wales—Meteorology.** Russell.
 Results of Rain, River, and Evaporation Observations made in New South Wales during 1898. By H. C. Russell. Sydney, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. lvi. and 236. *Map and Diagrams. Price 3s. 6d. Presented by the Sydney Observatory.*
- Queensland.** Dunstan.
 Report on the Geological Features of the country between Warren and Mount Lion in the Rockhampton District; with a Plan and Section. By B. Dunstan. (Queensland: Geological Survey. Bulletin No. 11.) Brisbane, 1900. Size 9×6 , pp. 10. *Presented by the Geological Survey of Queensland.*
- Society Islands.** Simons.
 Trade of the Society Islands for the year 1899. Foreign Office, Annual No. 2498, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 8. *Price $\frac{1}{2}$ d.*
- Tasmania—Macquarie Harbour.** Bell.
Papers & P.R.S. Tasmania, 1898-1899: xxviii.-xxxiii.
 Macquarie Harbour, its Physical Aspect and Future Prospects. By C. Napier Bell.
- Western Australia.** Fraser.
 Western Australian Year-Book for 1898-99. (Eleventh Edition.) By Malcolm A. C. Fraser. Vol. i. Perth, 1900. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 314. *Map and Illustrations. Presented by the Western Australian Government.*

POLAR REGIONS.

- Antarctic.** C. Rd. 131 (1900): 479-481. Arctowski.
 Sur l'ancienne extension des glaciers dans la région des terres découvertes par l'expédition antarctique belge. Note de M. Henryk Arctowski.
- Antarctic.** Fricker.
 The Antarctic Regions. By Dr. Karl Fricker. London: Sonnenschein & Co., 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. xii. and 292. *Maps and Illustrations. Price 7s. 6d.*
 A translation of Dr. Fricker's admirable summary of the knowledge possessed of the antarctic regions down to 1895. More recent results are not described, and in several points a revision of the text would have been advantageous, while a fuller bibliography, including recent English writings, would have helped the student.
- Antarctic.** P.R.S. Edinburgh 22 (1897-99): 66-70. Geikie.
 Notes on some Specimens of Rocks from the Antarctic Regions. By Sir Archibald Geikie, F.R.S. With Petrographical Notes, by J. J. H. Teall, F.R.S.
 These specimens include rocks collected by Captain Robertson, of the *Active*, at Dundee island in 1893, and others collected by Mr. Borchgrevink in 1895 at Cape Adare (not Cape Adair, a mis-spelling which appears to date from about five years ago).
- Antarctic.** P.R.S. Edinburgh 22 (1897-99): 58-61. Sharman and Newton.
 Notes on some additional Fossils collected at Seymour island, Graham's Land, by Dr. Donald and Captain Larsen. By George Sharman and E. T. Newton, F.R.S. *With Plate.*
- Antarctic.** Deutsche Rundschau G. 22 (1900): 529-535. Stefan.
 Fünfzehn Monate im südlichen Eismeer. Von Alois Stefan. *With Map.*
 An account of the Belgian expedition.
- Arctic—Andrée's Expedition.** Zimmermann.
 Le sort de l'Expédition Andrée. Par M. Zimmermann. Lyon, 1900. Size $10 \times 6\frac{1}{2}$, pp. 24. *Presented by the Société de Géographie, Lyons.*
- Arctic—Bear Island.** Nathorst.
 Ueber die oberdevonische Flora (die "Ursaffora") der Bären Insel: vorläufige Mitteilung. Von A. G. Nathorst. (Reprinted from *Bulletin of the Geol. Instit. of Upsala*, No. 8, vol. iv. pt. II, 1899.) Upsala, 1900. Size $10 \times 6\frac{1}{2}$, pp. 6. *Plates.*

Greenland.

Nathorst.

Om myskoxen och myskoxjagter på Ost-Grönland, 1899. Af A. G. Nathorst. Size $8\frac{1}{2} \times 6$, pp. 28. *Map and Plates. Presented by the Author.*

On musk-oxen and the hunting of musk-oxen in East Greenland.

Polar Marine Faunas. *P.R.S. Edinburgh* 22 (1897-99): 311-349.

Thompson.

On a supposed resemblance between the Marine Faunas of the Arctic and Antarctic Regions. By D'Arcy Wentworth Thompson, C.B.

Prof. D'Arcy Thompson controverts the evidence brought forward by Sir John Murray as to the specific identity of forms of life in the regions surrounding the north and south poles.

Spitsbergen.*Scottish G. Mag.* 16 (1900): 534-550.

Bruce.

Spitsbergen, 1898 and 1899: Voyages with H.S.H. the Prince of Monaco. By William S. Bruce. *With Illustrations and Map.*

MATHEMATICAL GEOGRAPHY.**Astronomy.**

Cohn.

Central bureau der Internationalen Erdmessung. Neue Folge der Veröffentlichungen, No. 2. Ableitung der Declinationen und Eigenbewegungen der Sterne für den Internationalen Breitendienst. Von Dr. Fritz Cohn. Berlin, 1900. Size $11\frac{1}{2} \times 9$, pp. 66.

On the declination and proper motion of the stars utilized for international determinations of latitude.

Cartography. *Rev. G.* 46 (1900): 277-283, 349-355, 416-423; 47 (1900): 5-11. Lejeaux.

Notice Historique succincte sur la Cartographie. Par M. A. Lejeaux.

"Chronometer" Tables.

Davis.

"Chronometer" Tables; or Hour Angles for Selected Altitudes between Latitudes 0° and 50° , with variations for 1' in all elements. By Percy L. H. Davis. London: J. D. Potter, 1899. Size $10\frac{1}{2} \times 8$, pp. 206. Price 10s. 6d. *Presented by the Author.*

Date-line.

Downing.

Where the Day Changes. By Dr. A. M. W. Downing, F.R.S. (Reprinted from the *Journal of the British Astronomical Association*, vol. x. No. 4, p. 176.) Size $10 \times 6\frac{1}{2}$, pp. 4. *Map. Presented by the Author.*

This is summarized in the *Journal* for April, vol. xv. (1900), p. 415.

Geodesy.

Veröffentlichung des Königl. Preussischen Geodätischen Institutes. Neue Folge, No. 3. Astronomisch-Geodätische Arbeiten. I. Ordnung. Bestimmung der Längendifferenzen Knivsberg—Kopenhagen und Knivsberg—Kiel im Jahre 1898. Bestimmung der Polhöhe und des Azimutes auf den Stationen Dietrichshagen, Wilhelmshaven und Knivsberg in den Jahren 1895, 1896 und 1898. Berlin: P. Stankiewicz, 1900. Size $11\frac{1}{2} \times 9$, pp. viii. and 216. *Presented by the Institute.*

Observations for Position. *Ann. Hydrographic* 28 (1900): 320-327.

Fulst.

Zur Höhenberechnung. Von Dr. O. Fulst.

On the methods of calculating the altitude of a star.

Photographic Surveying. *M. Militär-G.I.* 19 (1899): 78-144.

Hübl.

Die photogrammetrische Terrainaufnahme. Von Arthur Freiherrn von Hübl. *With Maps and Illustrations.*

Describes the apparatus and method of use adopted for photographic surveying in the Austrian army.

Surveying.

Heimbrod.

Topographic Surveying. By George Heimbrod. Part i.

Tables for Determination of Latitude and Azimuth by Altitude Observations of δ Octantis out of the Meridian. Computed by George Heimbrod.

Table for Converting Difference of Latitude in Links into Arc.

Table for Convergence of the Meridian.

Table of Sidereal Time of Elongations of 47 Circumpolar Stars. By G. Heimbrod.

From the *New Zealand Surveyor* 13 (1900). *Presented by the Author.*

A series of papers on practical surveying, with tables for astronomical determinations of position in the southern hemisphere.

- Surveying—Heights.** *M. Militär-G.I.* 19 (1899): 41-77. Steeb.
 Die Ausgleichung mehrfach gemessener Höhen bei der Militär-Mappierung.
 Von Christian Ritter von Steeb. *With Map and Diagram.*
 On the methods of determining heights in exact surveying.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

- Age of the Earth.** *T.R. Dublin S.* 7 (1899): 23-66. Joly.
 An Estimate of the Geological Age of the Earth. By J. Joly, D.Sc.
 By considering the amount of sodium salts in the sea, and the rate at which such salts are carried in by rivers, Prof. Joly comes to the conclusion that the age of the Earth is approximately 99,000,000 years, but making certain deductions which he believes to be warranted, he arrives at 89,000,000 years as the probable age.
- Avalanches.** *Jahrb. Schweiz. Alpenclub* 35 (1899-1900): 268-292. Sprecher.
 Grundlawinenstudien. Von F. W. Sprecher. *With Illustrations.*
- Fjords.** *B. Geolog. I. University Upsala* 4 (1899): 157-226. Nordenskjöld.
 Topographisch-geologische Studien in Fjordgebieten. Von Otto Nordenskjöld.
With Maps and Illustrations.
- Magnetic Phenomena.** *T. Canadian I.* 6 (1899): 315-358. Harvey.
 The Magnetic Influence of the Sun on the Earth and on Comets. By Arthur Harvey.
- Meteorology—Rain.** *J. and P.R.S. New South Wales* 33 (1899): 63-68. Deane.
 Suggestions for depicting diagrammatically the Character of Seasons as regards Rainfall, and especially that of Droughts. By H. Deane. *With Diagram.*
 The author proposes to represent graphically by means of a curve the degree of saturation (apparently of the surface layers of the soil), starting from the condition of saturation after heavy rain, and showing the rate of drying until an absolute drought results or until more rain falls.
- Meteorology—Rain.** *J. and P.R.S. New South Wales* 33 (1899): 69-85. Knibbs.
 Observations on the Determinations of Drought-Intensity. By G. H. Knibbs.
 A criticism of the foregoing paper of Mr. Deane's, showing the extreme difficulty of arriving at the relationship between rainfall, absorption, evaporation, and percolation required in order to construct diagrams of drought-intensity.
- Meteorology—Temperature.** *Meteorolog. Z.* 17 (1900): 356-372. Müttrich.
 Ueber den Einfluss des Waldes auf die Lufttemperatur nach den in Eberswalde an verschiedenen aufgestellten Thermometern gemachten Beobachtungen. Von Prof. Dr. Müttrich.
 The general result of long-continued observations was to show that from November to January the mean daily temperature was the same in a wood as in the open field, but from June to August it was about 1° Fahr. lower in the wood than in the field, and in the other months about 0.5° Fahr. lower. From 8 a.m. to 6 p.m. at all times of the year the field station was the warmer; but from 8 p.m. to 6 a.m. it was the colder, the natural result of free radiation.
- Meteorology—Temperature.** *Rev. Scientifique* 14 (1900): 15-16. Duponchel.
 Les actions planétaires et la température terrestre en 1900. Par M. A. Duponchel.
 An attempt to correlate the occurrence of warm and cold years with the relative positions of the planets with respect to the Earth.
- Meteorology—Winds.** Lemström and Dannholm.
Öfversigt Finl. Vet.-S. Förhandlingar 40 (1897-98): 220-231.
 On the variations in the velocity of winds. By Selim Lemström and J. Dannholm.
With Diagrams.
- Oceanic Life.** Monaco.
 Résultats des Campagnes Scientifiques accomplies sur son Yacht par Albert I^{er} Prince Souverain de Monaco publiés sous sa direction avec le concours de M. Jules Richard. Fasc. xiii.-xvi. Imprimerie de Monaco, 1899-1900. Size 14 x 11½.
Maps and Plates. Presented by H.S.H. the Prince of Monaco.
 These deal with the results of the study of the biological specimens collected in the Atlantic by the Prince of Monaco. Two maps accompany the memoirs, one showing the track of the *Princesse Alice* in the neighbourhood of the Azores during the cruises of three consecutive years, the other a bathymetrical chart of the sea surrounding the Azores on a large scale.

LE 1 INCH = 96 MILES

150 200 250 300 MILES

s of British Occupation -----

1

2

70

24

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

- Anthropology.** *T. Canadian J.* 6 (1899): 313-344. Chamberlain.
 Primitive Nature Study. By Alex. F. Chamberlain, PH.D.
 On the study of nature amongst primitive peoples as indicated by their traditions and beliefs.
- Historical—Hanno.** *Nautical Mag.* 69 (1900): 557-561. White.
 The Log-book of Hanno, the Carthaginian. With Notes by J. Dundas White.
 A transcript of Falconer's (1797) translation of the Greek text of Hanno, with notes from Bunbury and other sources.
- Historical—Maps.** *Papers and P.R.S. Tasmania* (1898-1899): xli.-xliv. Walker.
 The Cartography of the Terra Australis and New Holland. By J. B. Walker.
- Historical—Martin Behaim.** Ravenstein.
 Martin de Bohemia (Martin Behaim). Por E. G. Ravenstein. Lisboa: Livraria Féris [not dated]. Size 9½ x 6½, pp. 66. Presented by the Author.
- Political Geography.** *B.S. Languedoc. G.* 22 (1899): 311-351. Duponchel.
 Questions de politique coloniale. La liberté des mers. Par A. Duponchel.
- Towns.** *J. Camera Club* 14 (1900): 111-113. Mill.
 Town Sites, from a Geographical Point of View. By H. R. Mill, D.Sc.

BIOGRAPHY.

- Berzeviczy.** *Jahrb. Ungar. Karpathen-V.* 27 (1900): 76-87. Weber.
 Gregor Franz von Berzeviczy, ein Bahnbrecher der Touristik vor 100 Jahren. Von S. Weber.
- Camperio.** *B.S. Khédiv. G.* 5 (1900): 420-422. Schweinfurth.
 Manfredo Camperio. Par M. le Dr. E. Schweinfurth.
- Paulitschke.** *M.G. Ges. Wien* 43 (1900): 101-109. Hein.
 Zur Erinnerung an Dr. Philipp Paulitschke. Von Dr. Wilhelm Hein.
- Purtscheller.** *Deutsche Rundschau G.* 22 (1900): 423-424. ———
 Ludwig Purtscheller. With Portrait.
 Born in 1849, a noted mountaineer, died in 1900.
- Raffles.** Egerton.
 Sir Stamford Raffles, England in the Far East. By Hugh Edward Egerton, M.A. (Builders of Greater Britain.) London: T. Fisher Unwin, 1900. Size 8 x 5½, pp. xx. and 290. Frontispiece and Maps. Price 5s. Presented by the Publisher.
 A short biography of the great pioneer of British enterprise and influence in the Malay archipelago. The two maps are very rough sketches.
- Tillo.** *Le Globe, B.S.G. Genève* 39 (1900): 113-115. Schokalsky.
 Le général de Tillo. Par M. J. de Schokalsky.
- Tricoche.** *Rev. G.* 47 (1900): 51-53. Drapeyron.
 Le général Tricoche, président de la Société de Topographie de France (1892-1900). Par M. Ludovic Drapeyron.
- Vallentin.** *Deutsche Rundschau G.* 22 (1900): 569-571. ———
 Dr. Wilhelm Vallentin. With Portrait.
 Dr. Vallentin, born in 1862, "ein echter selfmademan," travelled in Kamerun while a German official, and subsequently became a burgher of the Transvaal.
- Wüllerstorff und Urbair.** *Deutsche Rundschau G.* 22 (1900): 422. ———
 Bernhard Freiherr v. Wüllerstorff und Urbair. With Portrait.
 Gives picture of a memorial portrait tablet unveiled on the fortieth anniversary of the cruise of the *Nevea* in honour of her commander.

GENERAL.

- Bibliography.** ———
 Americans, Iles Philippines. (Livres Anciens et Modernes en vente aux prix marqués chez Martius Nijhoff à la Haye, Nobelstraat 18. No 298. 1900.) La Haye: M. Nijhoff, 1900. Size 9 x 6, pp. 132.

Bibliography of Geography.**Raveneau.**

Neuvième Bibliographie Géographique Annuelle 1899, publiée sous la direction de Louis Raveneau.—*Annales de Géographie*. No. 47, 9^e Année, 15 Septembre 1900. Paris: A. Colin. Size 10 x 6½, pp. 320.

Bibliography Index.**Cantineau.**

Société de Géographie de Lille. Liste des Conférenciers disposée par ordre alphabétique indiquant les Conférences faites par chacun d'eux à Lille et désignant celles qui ont été insérées dans le Bulletin dressée pour les vingt premières années d'existence de la Société. 1880-1899. Par M. E. Cantineau. Lille, 1900. Size 10 x 6½, pp. 24.

List of the papers read to the Lille Geographical Society during the twenty years 1880-1899.

Commercial Geography.**Courtaux and Guzmán.**

Tratado de Geografía Comercial de las cinco partes del Mundo. Por Edgar Courtaux y Francisco y Guzmán. Buenos Aires, 1900. Size 10½ x 7, pp. 402 and 320. *Maps and Diagrams*. Presented by the Authors.

This treatise on the commercial geography of the five continents was prepared for the Congress of Commercial Geography held in connection with the Paris Exhibition. It is the first of a series of publications to be produced by an association recently founded in Buenos Aires under the title of Geografía Veritas.

Commercial Geography—Asphaltum.

Asphaltum. (The Philadelphia Museums. Scientific Department. Bulletin No. 2.) The Philadelphia Museums, 1900. Size 9½ x 6, pp. iv. and 20. *Map*. Presented by the Museums.

Commercial Geography—Roads.**Lyautey.**

De l'emploi de la main-d'œuvre militaire à la construction des voies de communication. Par le Colonel Lyautey. (Congrès International de Géographie Économique et Commerciale. Rapports sur les questions mises spécialement à l'étude. 1^{re} section—Question iv.) Paris: Société de Géographie Commerciale [1900]. Size 10½ x 7, pp. 8.

German Colonies.**Townley.**

German Colonies for the year ending June 30, 1899. Foreign Office, Miscellaneous, No. 528, 1900. Size 10 x 6½, pp. 50. Price 3d.

Ice-breaking Steamers. P.I. Civil Engineers 140 (1900): 109-129.**Runeberg.**

Steamers for Winter Navigation and Ice-breaking. By Robert Runeberg. *With Plate*.

Medical Geography. B.S. d'Études Colon. 7 (1900): 629-638.**Broden.**

De l'influence des températures élevées sur l'organisme humain. Par le Dr. A. Broden.

Record of experiments which have led to the conclusions that heat alone is no obstacle to the acclimatization of Europeans, but that in order to work in hot countries it is necessary for a European to subject himself to a severe hygienic regime.

Medical Geography—Malaria. B.S. d'Études Colon. 7 (1900): 533-552.**Poskin.**

Note sur l'étiologie, le diagnostic et le traitement de quelques formes cliniques de la Malaria. Par le Dr. A. Poskin.

Medical Geography—Plague. Quarterly J.R. Meteorolog. S. 26 (1900): 37-94. Latham.

The climatic conditions necessary for the propagation and spread of plague. By Baldwin Latham. *With Diagrams*.

This is a remarkable paper, illustrated by an immense collection of diagrams comparing the duration and intensity of plague outbreaks with the variation of the chief meteorological elements. The author traces an interesting connection between the periods of severe outbreaks and the period of maximum evaporation from the soil, i.e. the close of the wet season in the tropics.

Oriental Literature.**Müller.**

The Sacred Books of the East, translated by various Oriental scholars and edited by F. Max Müller. Vol. xlv. Oxford: The Clarendon Press, 1900. Size 9 x 6, pp. lii. and 596.

lost in the surrounding elevated plains, or are represented only by isolated peaks at various intervals rising from the latter. Apart from this the result is very satisfactory, and on the whole it is evident that great care has been taken in the production of the map, both as regards its compilation and lithography. A special feature is the indication of the altitudes by different shades of the same colour instead of using different colours, as is sometimes the case.

In addition to the orographical features, the boundaries between the different countries are shown by a dotted line, and the names of the countries, principal towns, rivers, etc., are given. The latter have been well chosen, and an attempt has been made to print them so as to prevent the map from having the appearance of being overcrowded, and in such a manner that they should not interfere more than is necessary with its clearness. The spelling of some of the names will require revision in a new edition. On the north-west sheet, Åbo is given as Abo, Malmö as Malmø, Örebro as Orebro, Vesterås as Vesteras, Torned as Tornea. Then, again, Alençon, in France, appears as Alencon, and several other cases might be mentioned. Some of the more important canals are shown, but there is at least one other, the Tikhvin canal, which connects the Volga with Lake Ladoga, that ought to have been given. The connection between Lake Ladoga and Lake Saima might also have been shown.

However, these slight corrections can easily be made in a new edition, which will soon be called for if the map is appreciated and taken up by teachers and others as it deserves to be.

ASIA.

China.

Service Géographique de l'Armée, Paris.

Théâtre des Opérations en Chine. Environs de Pékin. Scale 1 : 300,000 or 4·7 stat. miles to an inch. Service Géographique de l'Armée, Paris, 1900. Price 2 fr.

The country between the coast at Taku and Pekin is shown on this map, which has been specially prepared in connection with the present crisis in China. It is clearly drawn, and printed in colours. A plan of Pekin, on the scale of 1 : 50,000, is given as an inset.

Indian Government Surveys.

Surveyor-General of India.

Indian Atlas, 4 miles to an inch. Quarter-Sheets: 37 n.w., parts of district Khândesh, Native States of Baroda, Rewa, Kântha, Chhota Udepur and Khândesh agencies (Bombay Presidency), and Native States of Barwâni, Mathwâr, Rajpur Ali, and Indore (C. I. Agency), 1900; 64 s.w., parts of district Kângra (Punjab), of Rukshu (Kashmir) and Great Tibet, additions to 1899; 76 s.w., parts of districts Cud-dapah, Kurnool, and Nellore (Madras Presidency), 1900; 127 n.e., parts of districts Noakhali, Chittagong (Bengal), South Lushai Hills (Assam), and Northern Arakan (Lower Burma), additions to 1898.—Upper Burma Survey, 1 inch to a mile: Nos. 350, parts of Mông Mit and Northern Shan States, Seasons 1896-99; 401, parts of Northern and Southern Shan States, Seasons 1897-98, 1899.—Central Provinces Survey, 1 inch to a mile: Nos. 8, parts of districts Nimar (Central Provinces) and Khandesh (Bombay Presidency), and of Indore State (C. I. Agency), Seasons 1869-70 and 74-76, 1899; 18, parts of districts Hoshangabad and Betul (C. Provinces), Seasons 1864-66 and 1867-69, 1899; 22, parts of district Hoshangabad (C. Provinces) and Native State of Bhopal (C. I. Agency), Seasons 1863-64 and 73-74, 1899; 28, parts of districts Betul (C. Provinces) and Ellichpur and Amraoti (Berar), Seasons 1845-50, 66-69 and 84-88, 1900.—Hyderabad Survey, 1 inch to a mile: No. 110, parts of districts Betul (C. Provinces) and Ellichpur and Amraoti (Berar), Seasons 1845-50, 66-69 and 84-88, 1900.—North-Western Frontier Punjab Revenue Survey, 1 inch to a mile: No. 12, District Hazâra, Seasons 1865-69, 1900.—North-Eastern Frontier, 1 inch to a mile: parts of district Lakhimpur (Assam), of Singpho-Nagâ Hills, Hukong valley, Bor Hkamti, and Maru Kachin countries, 1899.—South-Eastern Frontier, 1 inch to a mile: No. 7 (2nd edit.), parts of districts Tungu, Amherst, Salwin, Tharrawadi, Thongwâ Pegu, Hanthawadi and Thâton (Lower Burma), and of the Kingdom of Siam, additions to 1899.—District Akola (Hyderabad assigned districts), 8 miles to an inch, 1900.—District Bareilli (N.W. Provinces and Oudh), 8 miles to an inch, 1900.—District Simla (Punjab), 16 miles to an inch, 1900.—District Hoshangabad (C. Provinces), 4 miles to an inch, additions and corrections to 1899.—District Peshâwar, 4 miles to an inch, additions to 1899.—Assam, 32 miles to an inch, 1900.—Sind, 16 miles to an inch, additions and corrections to 1900.—Kathiawar, 16 miles to an inch, 1900.—Punjab, 80 miles to an inch, additions to 1899.—Bengal, index map showing scales of survey, corrected to 1899.—Punjab, Index map showing surveys by Forest Department, corrected to 1899. *Presented by H.M. Secretary of State for India, through the India Office.*

AFRICA.

Egypt.

Survey Department, Cairo.

Map of Egypt. Scale 1 : 500,000 or 7·8 stat. miles to an inch. Sheet C4, Dakhla Oasis. Survey Department, Public Works Ministry, Cairo, 1900. *Presented by the Director-General, Survey Department, Cairo.*

The Dakhla Oasis sheet of the Egyptian Survey adjoins that showing the Kharga Oasis, which was mentioned in the *Geographical Journal* of July last. It is, like the latter, printed in colours, and gives altitudes in metres above sea-level.

Egypt.

Survey Department, Cairo.

Map of the First or Assuan Cataract. Scale 1 : 10,000 or 276 yards to an inch. Survey Department, Public Works Ministry, Cairo, 1900. 6 sheets. *Presented by the Director-General, Survey Department, Cairo.*

This is a large-scale plan of the Nile in the neighbourhood of the First or Assuan cataract, and will be especially useful in connection with the irrigation works now in progress. The new reservoir dam is shown, and land under cultivation is distinguished by a tint of green. Altitudes are given in metres, and the mean water-level during the time of the survey is stated, but no attempt has been made to indicate the configuration of the bed of the river, either by contours or soundings.

Madagascar.

Locamus.

Carte de Madagascar. Scale 1 : 500,000 or 7·8 stat. miles to an inch. Par P. Locamus. Sheets : 7, Morondava ; 8, Fianarantsoa ; 9, Tuléar ; 10, Tarafangana. Paris : Maison Andriveau-Goujon, H. Barrère.

These four sheets complete this map of Madagascar, which consists altogether of twelve sheets, and has been compiled from the most reliable information. It is printed in colours, and is altogether a most artistic production ; but, as is the case with many maps of the kind, it would have been better if less attempt had been made to fill in the unexplored parts from imagination or altogether unreliable information. At any rate, the map would have been more serviceable if these had been more clearly distinguished from parts that are tolerably well known and mapped.

AMERICA.

United States.

U.S. Geographical Survey.

Geologic Atlas of the United States. Scale 1 : 125,000 or 1·8 stat. mile to an inch. Folios : Wartburg, Butte, Truckee, Sonora, Nueces, Bidwell Bar, Tazewell, Boise, Richmond, London, Tennille District, Roseburg, Holyoke, Big Trees, Absaroka, Standingstone, Tacoma, Fort Benton, Little Belt mountains, Telluride, Elmore. Department of the Interior, United States Geological Survey, Charles D. Walcott, Director, Washington, D.C. *Presented by the U.S. Geological Survey.*

Each of these folios contains four sheets, viz. the "Topographic" sheet, the "Historical Geology" sheet, the "Economic Geology" sheet, and the "Structure-Section" sheet, all of which include the same area, and are on the same scale. In addition to these, full explanatory letterpress is given.

PACIFIC OCEAN.

New Caledonia.

Laporte.

Carte de la Nouvelle Calédonie, dressée pour l'Union Agricole Calédonienne par le Commandant Laporte (Breveté d'Etat-Major) d'après les travaux des Officiers de la Mission Topographique les cartes hydrographiques de la Marine et les plans du Cadastre. Dessinée et gravée par R. Hausermann. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Augustin Challamel, Paris, 1900. 8 sheets.

This is a large scale map of the island of New Caledonia on eight double-elephant sheets, compiled by Commandant Laporte for the Caledonian Agriculture Union from the latest information and surveys. The relief is shown by a series of brown contour-lines at intervals of 50 metres ; heights are also given in figures. Forests are coloured green, and the water blue. There is a plan of Numea on the scale of 1 : 40,000 given in the lower left-hand corner of the eastern sheet. Apart from the contour-lines, the map contains little detail to justify its being drawn on so large a scale.

CHARTS.

United States Charts.

U.S. Hydrographic Office.

Pilot Chart of the North Atlantic Ocean for September, 1900. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Asia.

Benn

Forty-seven Photographs taken by Captain R. A. E. Benn during his journey from Quetta to Europe *via* Persia and Transcaucasia. Presented by Captain R. A. E. Benn.

These photographs were taken by Captain R. A. E. Benn during a journey from Quetta, across Northern Baluchistan to Seistan, thence through the eastern frontier region of Persia to Meshed, and across the Russian boundary to Askabad on the Trans-Caspian railway, by which he travelled to Krasnovodsk on the Caspian, and thence to Europe by steamer to Baku. The photographs, though small, are especially interesting from the fact that many of them were taken in districts but rarely visited by Europeans.

(1) Girde Talao camp, 12 miles from Quetta, Chiltan peak with snow in distance; (2) Riding camels, unsaddled; (3) Mourners for the late Sardar Allyar Khan, Raisani, at the house of his son, Camp Kanak; (4) Camp Kirdgap: riding camels, saddled; (5) The new fort at Nushki; (6) New bazaar at Nushki; (7) The Jamalani, Badini, and Mengal Sardars at Nushki; (8) Beggar women at Paghak; (9) A well at Yardgar Chah, Nushki-Seistan road; (10) Brahui camel-drivers; (11) Dalbandin fort; (12) Guides mounted on camels; (13) Bit of the road between Nushki and Dalbandin; (14) A typical block house on the road; (15) Miroi fort; (16) Ware Chah; (17) "Ido," the wrestler, of Makak; (18) Koh-i-malik Siah, with fort of Robat; (19) The Koh-i-malik Siah; (20) The tomb of the "Malik Siah"; (21) Buried city near Kundi, Seistan, exterior; (22) Buried city near Kundi, Seistan, interior; (23) The start from Seistan, Guide Khan Mahomed, Baluch; (24) Mahomed Yusuf Khan, Sardar of Dast-i-Gird, near Khaf; (25) A bit of the Ahinguram pass between Gazik and Sangun; (26) A bivouac at Sangun; (27) Bivouac at Mozenabad; (28) Approach to the Gulu-ishtar pass, penetrating the Koh-i-Barkhat range—my caravan of donkeys; (29) Curious leaning tower at Kharab, built by Abbas Shah; (30) British Consulate buildings at Meshed; (31) A Russian cart at Meshed, used between Askabad and Meshed; (32, 33) A street scene, Meshed; (34) The holy shrine, showing entrance to the "Bast"; (35) A bit of the tomb of Imam Reza; (36) Outside a bath; (37) The cemetery at Meshed; (38) A Persian butcher; (39) M. de Ponafidine, Russian Consul-General at Meshed; (40) Turcoman guide between Meshed and Askabad; (41) A bit of the Askabad military road; (42) A bit of the Transcaspian railway; (43) *s.s. Alexander*, crossing the Caspian from Krasnovodsk to Baku, group of exiles *en route* to Siberia on deck; (44) Railway accident near Beslani; (45) Station on the Petrosk-Moscow line; (46) C. B. Pony "Commandant," marched from Quetta to Seistan, and then carried me 360 miles in nine days to Meshed; (47) The Moscow express.

British New Guinea.

Guise.

Ten Photographs of scenery in the vicinity of the Kemp Welch River, British New Guinea, by R. E. Guise, Esq., 1900. Presented by R. E. Guise, Esq.

The Kemp Welch river in British New Guinea, near which these photographs were taken, flows in a north-and-south direction, and reaches the sea about 60 miles to the east of Port Moresby. The photographs give an excellent idea of the character of the country and the scenery in the neighbourhood. The following is a list of their titles:—

(1) Village of Koolupu, near Hood hill; (2) View from Koolupu village looking inland towards Owen Stanley range, Hood hill on the left; (3) Mount Guise; (4) View from Hood hill looking east-wise, Mount Guise in distance; (5) Mount Guise, Hood point; (6) Mouth of Wanigela river, Hood bay; (7) Village of Kemorupu, foot of Mount Guise, with teacher's house; (8) The Mani range, from Hood hill; (9) Village of Koolupu; (10) No title.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.





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DECEMBER, 1900.

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THE PRESIDENT'S OPENING ADDRESS, SESSION 1900-1901.*

THE most important geographical event since the close of the last session has been the return of the expedition of the Duke of Abruzzi from Franz Josef Land. His Royal Highness has the great merit of having personally organized and fitted out the expedition in every detail; and an expedition has seldom sailed which has been so carefully and thoroughly equipped. Its geographical results are of great importance, for it has finally discovered the northern limits of the Franz Josef group, and confirmed Nansen's discovery of a deep ocean to the north; while the sledging party under Captain Cagni reached the highest northern latitude yet attained. I had a very interesting conversation with the Duke of Abruzzi at Christiania, and, if it can be arranged, his Royal Highness will be pleased to give us an account of his expedition in the course of the session.

The Danish expedition to East Greenland, under Lieutenant Amdrup, has also returned, after successfully continuing the work of Dr. Nathorst last year, while a Norwegian whaler was able to follow the coast to $75^{\circ} 30' N$. Thus the dotted line which has so long indicated the supposed position of the East Greenland coast on our maps will now give place to a definite surveyed line; thanks chiefly to the persevering efforts of Danish geographers and explorers since the days of Graah.

We are still anxiously waiting for news of the expeditions of Sverdrup and Peary up Smith sound. The *Windward* went out to bring them succour, but she has not yet returned.

* Delivered at the Meeting of the Society, November 12, 1900.

The two recent expeditions to the antarctic regions have both supplied us with valuable information. In Dr. Cook's work there are extremely interesting appendices by members of the Belgian expedition; and Mr. Borchgrevink's paper is accompanied by a very able report on the meteorology and magnetic work of Sir George Newnes's expedition by Mr. Bernacchi, and by a map drawn by Mr. Colbeck, based on his own survey. The biological collections of Sir George's expedition have arrived, and have, I understand, been handed over to the authorities of the British Museum at South Kensington.

Our own antarctic expedition is now, at last, making progress as regards equipment and other arrangements. The ship is in an advanced state, and we have had every reason to be satisfied with the work of the Dundee Shipping Company. Captain Scott, R.N., the commander of the expedition, was only able to take charge last August, but he has already shown that he possesses many of those qualities which are essential for so difficult and responsible a post.

The German expedition is far more advanced than we are, in every department of its work, under the direction of its able and accomplished commander, Prof. von Drygalski; but this is because his Committees have seen the wisdom of giving him a perfectly free hand. I am glad to say that the commanders of the two expeditions have had an opportunity of becoming friends, and of exchanging views during the autumn; and Captain Scott, if not too much trammelled by Committees, will soon make up for lost time. Captain Scott has also derived very great advantage from his intercourse with the scientific men who are conducting dredging operations and physical investigations on board the *Michael Sars* on the Norwegian coast. Dr. Hjört and our gold medallist, Dr. Nansen, have given Captain Scott the results of their great experience as regards the best nets for dredging, and the latest inventions connected with oceanic researches generally. They spared no pains to inform him on these points, and, as they are gifted with remarkable powers of exposition, the advantage derived from conversations with them is very great. Captain Scott will, I am sure, desire to join in a cordial expression of thanks from this Society to our Norwegian colleagues.

Our friend Dr. Sven Hedin has, during the past year, been actively at work in the Lob-nor country and the basin of the Tarim; and I believe that his archaeological discoveries will throw a flood of light on the past history of that region. The complete record of the scientific work of Dr. Sven Hedin's former journey has, meanwhile, been published in a special number of *Petermanns Mitteilungen*, fully illustrated by maps. Another important geographical work which has appeared during the recess, is the statement of the Argentine case in the boundary arbitration now in progress. It is very fully illustrated by maps and photographic views. Still another excellent book is a 'Glimpse of

Guatemala,' which is most beautifully illustrated, with valuable chapters on the Maya ruins, by Mr. Maudslay, and a most charming and interesting narrative of travel by Mrs. Maudslay. The biography of my old friend Mr. Oswell, the companion of Livingstone, with an introduction by Mr. Francis Galton, is very interesting, and contains a good deal of hitherto unpublished matter respecting the early exploration of Southern Africa. The Duke of Abruzzi's ascent of Mount St. Elias, by Dr. Filippo de Filippi, is a beautifully illustrated work, with a well-written and interesting narrative.

It is in Africa that the greatest amount of geographical work has been done this year. But a review of it must, alas! commence with a reference to the loss of a valued young explorer. It was only last session that Captain Wellby's father read us the account of his gallant son's splendid geographical achievement in marching from Abyssinia to the Nile. You will all remember how we looked forward to welcoming him on his return from the front. Now that can never be. Captain Wellby has fallen, fighting for his country in a most righteous war. It was a glorious death, fitting close of an adventurous and active life. We are left to mourn the death of a young officer who was a great explorer and an ornament to the army. His noble example has been followed by others; for there has been remarkable activity in the exploration of Africa this year. Major Gibbons has followed Mr. Grogan from the Cape to Cairo. Mr. Moore has returned after his important investigation of the Central African lakes. Mr. Harrison has brought home an admirable map of the region between Lake Rudolf and Addis Abeba. Our gold medallist, M. Foureau, has safely returned after his wonderful journey across the Sahara, of which he has promised to send us some account. Last, but certainly not least, Dr. Donaldson Smith, who is an old friend and known to us all from his previous work, has made very remarkable journeys, involving new discoveries between Lake Rudolf and the Nile; and I am sure we are all delighted to welcome him here this evening.

Already the benefits to geographical knowledge of the effective occupation of the Sudan are beginning to be felt; the first sheets of the new maps of the Nile, as far as the Bahr Ghazal, the results of the survey under Colonel Talbot, have reached us; while Sir W. Garstin's journey up the Nile to the lakes will no doubt yield further important results in the same direction. Major Wynn has gone out to Abyssinia, and will shortly be followed by Major Austin and Major Bright, the two latter to the Sudan; and between them we may expect great accessions to our knowledge of the eastern tributaries of the Nile, and of their basins.

From South Africa again we have in the map room several sheets of the maps which have been made during the war by the surveyors sent out by the Intelligence Department. And in this connection I am pleased to learn that serious steps have been taken to carry out

administrative surveys of all those territories in Africa which are directly dependent on the Home Government, and that in conjunction with the other European Powers which have African possessions.

AN EXPEDITION BETWEEN LAKE RUDOLF AND THE NILE.*

By Dr. A. DONALDSON SMITH.

IN 1895, when my first expedition reached Lake Rudolf, it had been a whole year on the march, and had been successful also in exploring much more new country than I had anticipated, so I contented myself in making a fortnight's journey up the Mela river. On this side journey, however, I made up my mind, on looking across a vast expanse of plain towards the west, that some day I must pursue the setting sun from Rudolf to the Nile, and I continually watched for an opportunity to satisfy my desire. Since I could not do this at once, I filled in a part of the intervening time by a journey through some of the unknown parts of the Khingan range in Mongolia in 1897, a short account of which was published in the *Geographical Journal* of May, 1898.

The whole of the winter of 1898-99 I was in the jungle in Somaliland, hoping for an opportunity to cross the border, but owing to political reasons and to the gratuitous interference of the Consul-General, I was unable to put my project into execution until mid-summer. During May and June, while negotiations with the Foreign Office were under way, I employed my time in recruiting twenty-eight Sikhs and Gurkhas in the Punjab. I thought it advisable to enter *via* Kismayu, but the Mombasa local authorities stopped me. To be brief, I fitted out three distinct expeditions before I managed to get finally out of the reach of incomprehensible officials. I started from Berbera on August 1, 1899. After the first march eleven of my Sikh ex-Sepoy's deserted, having become aware that they must sweat occasionally, and that they could not be supplied with all the manifold luxuries they were accustomed to in the Indian army. Knowing that I should never succeed if I took one of the officially recognized headmen with me, I had great difficulty in getting Somali camel-men, since all the Berbera headmen formed a ring against me. Several camel-men having deserted me at Hargeisa, and fearing further official interference, I started across the Haud with only seventeen Somalis, and as many Gurkhas and Sikhs, besides my assistant, Mr. Frazer, and my excellent Goanese cook, kindly lent me by Captain P. Z. Cox. During the journey to the Shebeli river *via* Milmil, Sesebane, and

* Read at the Royal Geographical Society, November 12, 1900. Map, p. 712.

Sheneli, I increased my following to forty-eight men. Near Milmil a small caravan of camels and women which was following us was attacked by three highwaymen. One of the robbers was captured by my boys and brought before me. He was a lad of eighteen, with wiry limbs and an intelligent expression, and struck me as a likely recruit, and a better brigand than the majority of my men. So I contented myself by making him march handcuffed for a day, and then enlisted the homeless fellow as a camel-man. He became known as Ali Hatbury, or "Ali of the handcuffs," and proved one of my best boys.

My surveys began immediately upon leaving Sesebane. Although I had with me all the most recent maps, the "tug" Fafan had been given no resting-place by cartographers. All the way to the Juba river we had work to do filling in what had been to all intents and purposes a blank upon the maps, except where I came upon my old line of march in 1895 at Turr. Sportsmen had knocked about the country in places, but they evidently never thought that Longfellow's idea of a brook applied to a tug or wady from the different positions the poor sandy river-beds were made to assume.

At the end of our march on September 8, we reached the Shebeli river at a spot called Godi, over 400 miles from Berbera by road, and crossed without unloading the camels. It contained only from 2 to 3 feet of water in its deepest part. So dry was the country about the river that I pitched my camp in a dark grove of immense cedar trees within a few yards of the stream, not having to fear malarial poisoning. Not a single mosquito disturbed our rest at night. On September 11 we started west again across a rich river-made plain, passing numerous villages of Aulihan and Dagodi to the foot of the highlands, which intervene between the river Web and the Shebeli. We followed up a tug to its sources in these highlands, and found many pools of water in it. Considering the extreme dryness of the season, I believe this tug must be usually a flowing river. The natives would sell us nothing at any price, although they were rich in live stock. For the next few days we experienced a delightful change from the trying heat of the low plains, where the mean temperature for the twenty-four hours was over 90° Fahr. The plateau was only 2500 feet above the sea, but that was a sufficient elevation to give a slight tonic effect to the atmosphere. The land was only suitable for grazing purposes to a limited extent, since the granite and iron ore, of which the hills were composed, was bare, or else covered with a thin layer of sub-soil, which supplied nourishment to a tangled mass of mimosa and acacia trees and bushes. Inhabitants were consequently very few, and giraffes very plentiful. Water is to be obtained in holes in the rock.

Near some villages called Mucha, which we reached on September 14, there were some remarkable deep rock wells. Two days after leaving these we descended from the plateau and reached my old line of march

at Gohule. From here until we reached the Boran at El Dere I cannot add to the description I gave to you of the country when I read my paper before the Society in 1896. The rivers Web and Juba had only half their usual supply of water. The people were flourishing, and nothing could have exceeded their meanness in not wishing to sell us food, which made it most difficult for me to keep my men supplied, there being also little game on our line of march. The Boran, on the other hand, were most friendly. I must here refer to the Abyssinian method of annexation. In 1895 I saw the worst side of their treatment; but on my recent journey, I found that their treatment of tribes, once thoroughly brought to submission, was commendable. In their first attacks they are certainly very cruel, but later, when the natives have been so harried that they look upon their masters with the greatest respect, they are given back a good proportion of their belongings and very nearly their original self-government, but a moderate tax being imposed. From the Somalis to the Boran I was surprised to find the natives quite as rich apparently as they were before they had come under Abyssinian rule.

Since I could fill in many blank spaces on my former map before reaching Lake Stefanie, I started survey work again at El Dere, and continued it to the Nile. Marching in as straight a line as possible from Berbera, El Dere may be considered to be 750 miles by road and the same distance from the Nile. Three long marches from El Dere to Le lead us through a very wooded and broken country, where elephants abound and man is a rare visitor. There are many mountains scattered about, principally of limestone rock, and the deep wells at Le I now believe to have been originally formed by the disintegrating effects of water on chalk, in which the natives have actively assisted. My Somalis gave me infinite trouble and annoyance. They were never satisfied unless they had over ten pounds of camel meat or mutton a day per man, and when food was scarce I had to be constantly on the alert to prevent them from poisoning my transport animals, so that they could eat the meat, or from stealing sheep, but they were not, however, as miserable petty thieves as most of my Indians. All but four of them mutinied at a place called Gof on November 4, and remained out over night, putting me in a decidedly disagreeable situation. If I call my Somalis howling hungry humbugs, I describe some bad points of their character, but it would be unjust in me not to mention their superb physical condition, swift-footedness and endurance, and their intelligence, which made them compare favourably with the Indians. Of my nine Gurkhas, five only were pure-blooded men from the backwoods of Nepal, and these were among the best men in camp. The other four Gurkhas had Rajput or other blood in their veins, and it is with regret that I look upon them as human beings. These latter, and as many more Sikhs, continually

strove to commit suicide by hiding if the march was long, and gave me and the Somalis infinite trouble in hunting them up. Two Indians were cunning enough to evade the Somalis search-parties sent after them at different points on the journey, and were never heard from again. Whenever the march was protracted over five hours, either my assistant or I fell back far to the rear of the caravan to protect tired Indians from themselves.

Between Goff and Lake Stefanie the Abyssinian highlands are



Mursu.

Sikh.

Somali.

Gurkha.

ON THE OMO AT MURSU.

continued south as a long mountain chain all the way to Mount Koroli and Marsabit, near the southern end of Lake Rudolf, a fact that I was not aware of on my first journey. Proceeding westward three marches from Gof, and passing Egder, we arrived on November 8 at a large settlement called Gorili, at an elevation of 3000 feet, where the people welcomed us with large vessels of honey and milk. There were Arab and Somali traders among them from Kismayu, buying ivory in exchange for cattle.

On the next day we rose over 1500 feet to Mega, a beautiful broad open meadow or series of meadows between mountain peaks, into which tiny watercourses trickle, and where there was a delightful freshness in the atmosphere and in everything living. Besides the many cattle, sheep, goats, and donkeys which were to be seen grazing on the fine green grass, we were much impressed by the numerous droves of sleek ponies. For some reasons the natives west of Egder did not wish us to be a witness of their wealth, and whenever we managed to get a guide from them, he persisted in taking us by the most unfrequented paths, and away from the western course, which I was determined to pursue. I had finally to give up trusting in guides altogether, load up a two days' supply of water on camels, and march ahead. We camped when we got tired, irrespective of water or people, and then sent men in all directions to prospect. As it turned out, we usually found water and villages not far from camp, though with a considerable amount of trouble. We marched rapidly along easy paths after leaving Mega, through the same green upland basins, for a little over four hours, all of us revelling in the delicious cool atmosphere. The good old Gurkha Havildar voiced the sentiment of the crowd by exclaiming, "Ah! Sahib, if we could always have it like this."

We were at an elevation of over 5000 feet, when suddenly, on rounding a little promontory, the caravan was brought to an abrupt halt. We found ourselves perched on the edge of a precipice that sheared off almost perpendicularly down to a broad plain 1700 feet below us. Across the plain, some 30 miles to the west, rose what appeared to be a low mountain range, the southern extension of the Tertala mountains; but the plain itself we found to be over 3000 feet above the sea-level, a no mean elevation compared to the valleys of Lake Stefanie and Rudolf. On my first journey I crossed this plain 80 miles north of here, where it was only a narrow valley running up to its origin in the Amara mountains. The view was, indeed, magnificent from this great wall, the western edge of the Boran highlands, which run from the Amara to Marsabit, but it was appalling when I came to consider how my poor camels were to get beyond it. To my surprise, we found a winding path had been laboriously made by the natives for their donkeys, many stones, weighing two or three tons, having been rolled aside. We set to work on this road, and after a day's hard labour got it in fit enough condition to take the camels down empty. All the loads were carried down by my men, and then the long line of grunting, stumbling, patient "ounts" were shoved and lifted after. In spite of the inimitable Kipling, I have the greatest respect for the long-suffering camel. On this occasion only one animal was injured, but he was afterwards consumed by us to his last marrow-bone. Thus you see that the good that a camel does is not interred with his bones.

There were numerous villages about the foothills and on the plain,

and many natives helped us down the paths. The most important settlement, about an hour's march from the foot of the mountain, called Saki, was in a most flourishing condition, judging from the large numbers of cattle which the people owned. A couple of marches west of Saki we got into a very bad washed-out stony country, where the plain was cut into hideous designs by the rushing of the waters in times of flood. A guide whom we had got at Saki insisted on going to the north, which I would not do, so I felt that I had only myself to blame for getting into the bad land. It took five long marches to get across the plain, on account of several stretches of this character. A specimen of one of the tiny gazelle, or dig-dig, of this plain, which I



BAD LANDS, NEAR SAKI, EAST OF LAKE STEFANIE.

presented to the British Museum, has been proven to be new to science by Mr. Oldfield Thomas (*Madoqua guntheri smithii*). On November 19 we were among the mountains again, and not far from the south-east end of Lake Stefanie.

There was one rather isolated mountain called Janissa, 5600 feet high, which I decided to ascend while my camels were resting. From the top of it I got a splendid view, and picked up most important points of my previous journey—Mount Kanjaro, the Tertala range, Lakes Stefanie and Rudolf, and Mount Koroli—and could thus check my work, which I was most pleased to find correct. The trip was not without other advantages also, for on the very top of the mountain

I bagged two specimens of *Cervicapra chanleri*, a beautiful antelope not known to exist near Lake Stefanie. Two marches beyond Mount Janissa we came to what appeared to be an enormous barnyard, with a solid stone floor, and in the centre a bubbling warm spring. The water was sparkling with carbonic acid gas, tasting like acidulated seltzer, and it was evidently the drinking-place of many scores of elephants, judging from appearances. Elephants were ubiquitous; you could scarcely move in any wooded valley without disturbing many of them. The next day we were well down in the valley of Lake Stefanie, and looking forward to plenty of fresh fish and plenty of water for washing.

On November 26 we made an afternoon march to the south-east corner of the lake. Seeing a herd of elephants a long way off, I left the caravan, directing the men to march on to the lake and camp. After almost running an hour or more to catch up with the elephants, I came upon a herd of buffalo, and picking out a good bull, preferred him to the tuskers. Killing the bull and cutting him up took considerable time, and it was not until near sunset that I came in sight of the camp. To my horror I saw nothing but blazing grass where the camp should have been, and on some rising ground, covered with smoking ashes, stood my boys, looking like the central figures in one of Doré's conceptions of the *Inférno*. I certainly thought my ship had been burnt up, but my boys were only resting a moment after their heroic efforts to save the kit, which they had accomplished to the last camel-blanket. No wonder my camel-men's faces looked doubly sad when they brought me a tin of water and asked me to taste it. It was the briniest water I ever touched, and then I too felt sad. I learned that the lake with its undrinkable water was 2 miles away over a sea of mud covered with dead fishes. I only had two small barrels of water in camp, which I always carried for emergency, and these I divided immediately among the poor parched boys, who had been fighting the fire. Every man was tired, and yet I had to send at once several boys with camels to travel all night back to the mineral spring and fetch water the next day. Here is where the Somalis showed their pluck. Not a man that I ordered out objected, since it was a question of life or death. Other Somalis I sent in all directions to follow the paths made by the countless myriads of animals, and learn where they drank. Most of the Indians were dead to all intents and purposes, and considered themselves to belong already to another world. Luck was not so much against us, however, for in two hours my camel-men had found a spring of fresh water by following elephants' spoor, and soon after this the Indians were resurrected by a gallon of water each.

I will pass over our journey from this point to Lake Rudolf, which we reached on December 10. The formerly rich tribe of Rusia had

ceased to exist, and except a few representatives of the Hamar Koki tribe, we saw no human beings at all until we reached the river Nianam. The water was 12 feet lower in the shallow lake than it was in 1895.

I was quite surprised at first at the manner of our reception by the Murle and by their poverty. The rich villages that welcomed us in 1895 did not exist. There were only a few little groups of huts, principally on the west bank of the river, that showed the remnants of a once large and flourishing tribe. We spent nearly a whole day endeavouring to get the people to come to us; but finally, when we



GAZELLA GRANTII BRIGHTII.

gained their confidence, they were most eager to assist us. The secret of the natives' distress was to be found in Abyssinian raids. With the help of the natives and their canoes we easily crossed the Nianam, which was half dried up like all the streams we had crossed. On my first journey I followed up what I supposed to be the Nianam for a long distance to Mela; but since I was there that illustrious explorer, the late Captain Bottego, discovered another river, the Omo, coming in from the west. It is clear to me now that my river, which I will call the Mela, and the Omo together in equal volume join at Gumba to form the Nianam, the name given by Count Teleki to the large stream flowing into the lake.

A remarkable change now occurred in the fauna. Not only did

we find a completely different set of birds between the Nianam and the Nile, but scarcely any of the mammalia that we had been accustomed to were to be found in this western section. The Soemerings gazelle had given place to the larger Boran gazelle, and now this had disappeared, to make way for a smaller variety without any longitudinal black stripe on its side, and which Mr. Thomas has proved to be new after examining a specimen which I have given your museum (*Gazella grantii brightii*). The bouncing, nervous, long-necked Waller's gazelle, which had been a constant companion, was nowhere to be seen, but oribi and reed-buck took its place. Speake's gazelle was replaced by the beautiful *Gazella thomsoni*. The hartebeests, as a matter of course, thought it best to give themselves differently curved horns, and to go under the name of *Bubalis lehel*, Heuglin. The birds were represented by curious scarlet-breasted barbettes, with their enormous dentated bill for cracking hard berries; by curious tiny flycatchers, with large scarlet wattles around their eyes; and by more than a hundred other different species, all of them strikingly beautiful, belonging principally to the West African types. Many troops of monkeys made the tall forest about the rivers and ponds ring with their chatter. The most beautiful of these, a large horse-tailed colobus (*Colobus quereza poliura*), was found to be new on examination of some skins which I gave to the museum.

I may mention here that from the time we left the Boran gallas until we reached Arabic-speaking natives near the Nile, we could communicate with none of the tribes except by signs, unless we remained long enough at some village to pick up a few words of the vernacular. I had hoped to find some Masai, but there were none. The whole way to Tarangole the natives refused to give us guides, although they were friendly in other respects. This was to be accounted for, I suppose, partly in my refusal to pursue any other than a westerly course, when the natives advised my going north or south, or even east again, and partly through fear that the guides would be killed by their hostile neighbours. We kept our course, however, although we literally got into many a hole, and struck out each morning regardless of paths, waterways, or dire prophecies on the part of the natives.

The day after Christmas we bade the Murle good-bye, and struck out in a northerly direction that would bring us to the Omo, near the point where that stream makes an acute angle as it bends from north to east around the Mela hills. At the end of a long march over a grassy open plain, we came to a place where the loose fireclay which underlay the sub-soil of the plain had been cut away by the action of waters to a depth of 50 feet, and in the deep round basin a dense forest of giant sycamores, mimosa cedar, and tamarind trees stretched before us for about 2 miles. Finding plenty of elephant paths, we wandered through the dark woods the next morning until we came to a pretty lake a mile

long, in which a school of over a hundred hippopotami disported themselves. The forest was alive with animal and bird life. The elephants were, indeed, so numerous that their stench was most disagreeable. From here to the river the land was so cut up that we did not reach the Omo until we had made a second march in the afternoon. I may say that most of our day had been spent in passing around and over little hills of crumbling clay. The Mursu, whom we found on the banks of the Omo, had escaped the raids of the Abyssinians, and were in a most flourishing condition. After we had shot a couple of hippos for them, they became most friendly, and brought us much food, consisting of durrha, or sorgham, lentils, beans, maize, and dried tamarinds. I bought a small tusk or two from them at first to start trade; but when I discovered a long line of ebony-like forms bearing about a ton of ivory upon their shoulders to my camp, I had to cry a halt, as it was impossible for me to transport more ivory than I then had with me.

The Mursu and Murle are very identical in speech, customs, and appearance, but the Mursu have more of the warlike spirit of the Turkana than the Murle. The Mursu shave the hair well up from above their ears, and also behind the head, a custom observed by the Dume, Bunno, and other tribes living to the north of Lake Stefanie. Moving along the river with camels was hard work, owing to the thick forests, in which much cutting had to be done. Several of my camels died from eating a poisonous vine, and many were made so ill that they never recovered. I have found it always dangerous to allow camels to remain in forests along rivers or lakes for any length of time.

On January 3 we left the river, and, proceeding west, arrived on the second day's march at another little pond at a point where several river-beds unite in one very deep and wide ravine. Thence our route lay across a fertile river-made plain to the base of a low mountain range. I have little doubt, from what I saw of the valleys passing to the right and left of the various mountain ranges and from levels taken, that Lake Rudolf, the Nile, and the Sobat were once united in a vast inland sea. A couple of hours' climb on January 6 got us over the crest of the first range of hills and on to a valley 15 miles broad, that provided excellent grazing to the numerous domestic animals which the natives of these parts owned. The waterways contained plenty of water in pools, and there were many broad stretches of open pasture, while the lower hills surrounding the plain were almost treeless, but covered with fine green grass. On the west, a splendid mountain range ran for 20 miles along the length of the valley; the highest point, Mount Etua, over 7000 feet high, stood out in bold relief as a bare-pointed volcanic remains—a splendid point for surveyors, and a magnificent mass from an artist's point of view. We saw this point from the Omo river, and did not lose it until we were 40 miles the other side.

Almost all the natives fled to the hills on our approach, and seemed

inclined to fight. From their long parallel-sided shields, their Masai-like spears, and their tall athletic build, I made them out to be a branch of the Turkana. A lot of about twenty warriors attacked two of my camel-men one day, who were loitering behind the caravan with my sheep and goats, and were only driven off by my boys firing at them. This was the only time on the journey that the natives attempted hostilities. The people here call themselves Mushas, but I could not get any vocabulary from them, as I only managed to get speech with them on



MURSU ON THE RIVER OMO.

two or three occasions before I was about to quit their country. We kept pretty much to the valleys, which were at an elevation of 1700 feet as we progressed through their country for seven long marches, occasionally going over some mountain passes, where stretches of open upland meadows and grass-covered hills made me feel that I should be wearing tweeds instead of khaki. In such places there were usually a good number of small villages, but occasionally, where the bush was very thick, we sometimes did not see a sign of any inhabitants

for a distance of five miles. I frequently saw the male members of the tribe, and tried to get them to approach the caravan, but in vain, and occasionally I met a few old women who had remained in their villages while the caravan passed them, and once a dozen hunters came into camp to sell ivory. I bought a few ornaments and a beautifully tanned goat-skin apron from the women, which were very like the things in use among the Turkana. Except for the goat-skin apron worn by the women, the Mushas contented themselves with the same cleanly nakedness that was the fashion from the Boran to the Egyptians. The taller mountain ranges of this country are of volcanic origin, and in many cases their slopes are covered with abominable brecciated rock, principally granite, while most of the flat-topped hills are composed of argillaceous sandstone and shale. The surface of the valleys, which are for the most part covered with bush and forest, is composed of the richest alluvial soil underlaid with clay. To the south of our line of march the broad, yellow, grassy plains were considerably below 1700 feet from the sea-level. In a large valley at the outskirts of this country we remained a week to rest the camels, where a shower or two of rain had freshened up the foliage of the mimosa bushes. A day or two before we left, the natives living in the vicinity began to come to camp, finding that we did not disturb them; and if we had remained longer, no doubt we should have been on intimate terms with the whole tribe. They did not care to sell me any sheep, however, and for this and various other reasons connected with my outfit of men and camels, I thought it best to push on. While here we had the last of the autumn showers.

Since the changing climatic conditions of East Africa is now a subject of much importance, I must not omit to mention some of my meteorological observations. It is well known that the "karif," or fierce winds, that sweep the Somali coast in the summer months are a part of the northern trade winds. Now, these northerly winds persisted until we had got well beyond Lake Rudolf, and with them came a little rain. It was the autumn rains that are expected in Somaliland in September which first struck us in a sudden burst after we had left the Dawa river on October 13. These rains followed us all the way to our camp of January 13. They were very scanty, but it was curious that they should progress so from east to west. Half a dozen slight showers were all that any particular section of country received. The reason that Somaliland and the lowlands to the south of Abyssinia are so dry must be found in the drying effects of the Abyssinian highlands on the northern trade winds, the lofty mountain ranges condensing all the moisture in the air, and allowing only a pitiful drop or so to work south. All the rivers and lakes which came under my observation were half dried up—surely because there was a scanty rainfall this year in the Abyssinian highlands. The

secret can only be solved by a study of the changes that occurred in the northern trade winds. Hardly had we left our camp of January 13 before we began to see the natives preparing for a spring rain, and a spring rain dependent upon the monsoon winds from the south, which gives life to Uganda and most of the East African Protectorates. Thus we had arrived at a point where the autumn rains of one country, dependent on the northern trade winds, would have met the monsoon rains coming from Madagascar had not these been extremely late in arriving this year, as they were in reaching India. The famine which we found to spread all along the upper Nile was dependent upon the same conditions as the famine in India, and the very low condition of



CEDAR VALLEY.

the Nile at Cairo was caused both by the changes in the monsoon and also by the northern trade winds, since the Sobat rises in Abyssinia.

On January 21 we ascended a steep pass to a long narrow plateau, over 3000 feet above the sea, the game path which we took leading us along a beautiful clear-flowing brook shaded by tall cedar trees. The accompanying photograph shows a pool in "Cedar valley" near our camp at the top of the pass, in which a Gurkha is to be seen following my example in having a delicious cool plunge. The men I had sent ahead, and who had found the trail up Cedar valley, did not go far enough across the flat top of the ridge, and consequently did not discover that this ended abruptly in a sheer precipice on the other side.

Beyond, to the west and north-west, stretched a vast plain, as far as we could see. For a distance of about 30 miles the plain did not look so unattractive with its occasional little watercourses, fringed by many a pretty bit of green meadow or shady grove, but towards the horizon the monotonous greyish-white appearance of the surface looked very ominous. We spent three days on the top of the mountains in finding a game trail, and clearing this so that the camels could descend. Game was abundant, and it was in this country that I secured the specimens of the new gazelle, which I previously referred to, and also two varieties of buck, *Aurebia haggardi* and *Aurebia montana*.

At the foot of the hills we crossed at right angles the line of march of the late Captain Wellby. A couple of marches beyond this brought us to a large watercourse flowing west, where we found a new tribe of natives, the Magois. Noticing from the distance that the people were preparing for a fight and driving away their cattle, I pushed ahead with two boys, and persuaded them to desist from their hostile exhibitions. One stout young fellow in particular persisted for a long time in giving frequent leaps into the air to show that he would fight if called upon to do so, but this man proved afterwards to be as friendly and jolly as he was fat. He is shown in the accompanying photograph.



A MAGOIS YOUTH.

The Magois were distinctly different from any tribe previously met with on the journey in appearance and customs. They had the heavy build and large features, with high cheek-bones, of the Soudanese, and, above all, the lines of raised tattooing on their cheeks that is so typical of the people about the Nile. I believe that it is not unlikely that they are a branch of the Dinkas, who, perhaps, being driven from the Sobat by the Neurs, put the desert between themselves and their persecutors. They seem to care principally for small red beads, of which they had many already, some of them worked in gorgeous patterns on leather plaques, with which the warriors adorned their massive head-dresses. The most *outré* of our fashionable young men can never aspire to the height of collar worn by some of the Magois. With a collar of beads, which shoved their chin high up in the air, their locks done up in a great chignon, composed principally of clay covered with ostrich feathers, they looked the very pink of gay deceivers.

Parallel lines of raised tattooing on the chest and abdomen, leopards'

skins hung over the back, and a bell hung on a slender cord around the waist, helped to liven up the men's appearance. These are the only people whom I have ever seen wearing a zebra's tail suspended from the elbows. Many of the younger girls had rather attractive features and pretty figures, but I will not mention the appearance of the fair sex after they get to be twenty. The worst burden which they have to carry in life, however, seems to be the countless necklaces of beads which spread over their bosoms to the waist, and the large bracelets and anklets of ivory, brass, and iron. Their hair is shaved above the ears, and cut fairly close on the top of the head.

The Magois represented to us that if we went north-east again we would find a stream of water winding northward about the foot of the mountains into a bigger river a long way off, but I had no intention of going to the Sobat and thus leaving my work incomplete. Whenever I asked one of the natives about the plain to the west, he would draw his hand across his throat to represent that we must surely die if we attempted to march in that direction. However, we loaded up all our water-barrels and started on January 28 in a westerly direction, towards two mountains which loomed up on the plains. For a short distance the ground was firm, and we marched along swiftly, but then we came to the worst cotton soil I ever took men or beasts over. It was so loose that we sank in it up to our knees at one moment, while the next instant we stumbled in some crack hidden by a tuft of the coarsest yellow grass. The intense heat added to our burdens, so that we were glad to camp at the end of seven hours.

The next day's march was even worse than the first, and at the end of it I determined to stop and hunt for water about the two mountains, which were then near us. At the end of thirty hours the barren mountains and all the plain for many miles to the west had been scoured for water, but in vain. My animals had been nearly three days without food or water, so that there was nothing to do but to look disappointment in the face, and turn back to Magois. Two of my men found a stream, before reported by the natives, running north, where they told me there were many people and signs of cultivation. This was the stream I have since learned was followed by Captain Wellby to the Sobat. It starts in the mountains north-east of Magois, and not far away in the south.

Another of my scouts reported water directly east, and nearer the Magois, so in the afternoon of January 30 we started off in the direction indicated. My own Somali had been lying to me, since he had only seen what appeared to be a promising waterway, and took it for granted there was water in it without fully satisfying himself on the subject. Owing to this blunder we had one of the worst marches the next day that we experienced throughout the journey. From three o'clock in the morning until all hours the next night the wearied men and animals

plodded on in intense heat, and over the same terrible ground, to a pool of water which I finally found in the Magois river-bed, not far to the east of the Magois villages. At midday I distributed the last of the water we were carrying, which gave the men three pints each, not enough for many of the men, especially the Indians, but sufficient for Frazer and myself, although we had harder work to do than any of the escort.

At 5 o'clock, when I reached water, there were only a few boys and two camels loaded with empty water-barrels with me. These barrels were soon filled and sent back to revive the broken-down men, who were being taken care of by my assistant many miles behind; and then



NEAR MAGOIS.

came the hunting up of the camels and donkeys, which had been deserted by their camel-men, and which were roaming about in the dark among the bushes with all their loads on them. All the men we got safely into camp during the night or the following morning, but I never recovered from the loss which I sustained in transport animals. Some five camels died within the next two days, and as many more within a fortnight; five donkeys were lost, not one of my two dozen sheep and goats ever reached camp alive, and many boxes were injured. I was obliged to throw away much valuable kit. Besides this, the men became so disheartened that they never afterwards recovered from their apathy. Two days after this found us back again among our friends the Magois.

We determined now to follow the wady as far as we could, even though it took us a little south of west. Two short marches on February 5 and 6 brought us to a long pool of still water, but here the river-bed spread out in many little dried-up ditches, that lost themselves within a quarter of a mile in the plain. Here we found another branch of the Magois, who called themselves Katua, and represented that they were very independent of their immediate neighbours, and at war with a tribe called Toporan, living in the mountains west of Turkana. The Katua occupied a dozen large villages, and owned an immense number of cattle and other live stock. Although rich, they wore scarcely any ornaments, and did not care much for any other kind of beads than the wonderfully fashionable little red sim-sim. Trading went on merrily until I had bought about sixty sheep and goats, and my stock of red beads was getting low, owing to the many drains upon it. Cloth and blue and yellow beads, of which I had a large supply, were valueless. In the trading the women figured largely, to my great annoyance, as they were so long in making up their minds, and so hard at a bargain. I was obliged to play salesman to these women for many hours a day, and I often wondered if European salesmen ever have to exact the same amount of patience.

To my surprise, I discovered these people to be cow worshippers, and to indulge in certain rites which were supposed to be peculiar to the Hindoo religion. Plastering themselves with cow-dung, and throwing bits of dried *bois de rache* at every one and everything they liked, seemed to be a matter of much import to them, and occasionally some old man or woman would be quite unmerciful in giving me a too generous dusting. The origin of this cow worship is presumably the same with the Katua as with the Hindoo, traceable to the great dependence placed upon the animal for sustenance. The Katua eat the cow, but all their people turn out when the beast is killed, and go through much ceremony. They would not sell me a single cow.

We were again confronted by the waterless plain to the west, but to the south-west, however, rose a mountain range 40 miles away, that I thought must surely provide water, and thither I accordingly sent Ali Issa, whom I had made headman, and seven other Somalis with a week's supply of water and food to reconnoitre. I employed my time that was not given up to trading, in surveying and collecting and studying the natives, of whose language I made a short vocabulary.

Just here, for the first and only time on the journey, I found a number of Rüppell's reed-buck, the original *Cervicapra bahar*. The animal was first described by Rüppell nearly eighty years ago from a skull, probably brought down the Nile by traders, but it was not until the arrival of my complete specimens at the museum that all the characteristics of the animal were known. It stands 40 inches at the

shoulder, and is remarkable on account of its pretty light yellowish hair, and the peculiar forward bend of its horns.

The natives were very busy moving their villages to the hills in anticipation of the spring rain, and by the time my scouts returned, there was scarcely a soul left in the huts by the river. Ali Esa returned on February 12, and, to my great relief, reported water and people at the mountains before mentioned. We set out, therefore, once again across the abominable plain, and after four long marches arrived on



RAFFIA PALMS, COUNTRY OF THE AKARA.

February 15 at some wells situated among pretty hills, the most northern extension of the Uganda highlands. Far away to the south we got glimpses of great rocky masses, towering about 7000 to 8000 feet above the level of the sea. The friendly natives, who are called Akara and Dinka-Dings, did not understand a word of the Magois language, nor were they as heavily built or as black as the latter. Fairly tall and slender, with small features and moderate-sized noses, they resembled the Masai more than they did the Sudanese. They are again different to the Latuka, their immediate neighbours on the west.

Two more marches in a north-westerly direction took us across many very broad dry river-beds, in which the groves of handsome raffia palms, with their ripe yellow fruit, made a great display. The country was very thickly populated by the Akara, who seemed delighted to have us come among them.

According to old maps of this region, which were founded entirely on native reports, several running rivers should have been crossed by us on our journey from Lake Rudolf, one large one running north into the Sobat, and several others running north-west into the Nile. However many streams may rise in the tall mountains to the south, the water disappears except in the rainy season as it approaches the ghastly plain, and even the sandy beds themselves are soon obliterated in this great desert of the Sobat. Mr. Frazer and I made side trips to all the most northerly hills of the Akara, in order to secure further bases for the triangulation to the west, and to trace the courses of the wadies, which finally disappear on the surface of the plain not far from Katua.

Keeping westwards across a broad valley, we came to many more of the Akara, who were agriculturalists as well as stock raisers, and had substantial large wooden dwellings with peaked roofs. Some of the villages which we passed could easily have contained fifteen hundred souls or more. Although friendly and eager to trade, the Akara were very annoying in not pointing out to us where water lay to the west of each camp. The wadies, which contained water in pools and wells, ran only from south to north, and I suppose the natives thought me excessively stupid in not following these river-beds instead of intersecting them at right angles, which involved long marches across hot plains and a hunt at the end for water.

Near our camp of February 21, in a large open forest, I shot a male and female spotted bush-buck (*Tragelaphus bor*, Henglin), much to my delight, since they are the only specimens of this beautifully marked animal that have ever been secured.

On the 22nd we rounded the extreme northern end of one of the arms of the Dinka-Ding mountains, and camped near some villages at Lumin. A plain or valley similar to the one we had just crossed stretched before us to another arm of the southern highlands. We had some water difficulties crossing this plain, since my few remaining camels were loaded heavily enough without my burdening them with water. Some camel gave out almost every march, which necessitated my throwing away more and more loads. Although there was much to interest me, I cannot reflect on my journey from the time we reached the great desert of the Sobat until we arrived at the Nile with pleasure unalloyed, for shoving along a caravan of dying camels and would-be dead Indians, by the help of careless Somalis and a few tired though good Indians, for many weeks is a thing that one cannot forget. We were soon to meet more Sudanese tribes, the Latuka, together with the Okatela and Beri.

The Akara, Dinka-Dings, Turkana, Mushas, Mursu, and Murle seemed to belong to the Masai and to the aboriginal pigmies who live north of Lake Stefanie, and to have nothing in common with the Sudanese.

On February 27 we reached some pools of water on the plain, not far from the Okatela mountains, and the same afternoon my boys reported many natives to be watching us in a suspicious manner. Two of my Somalis, whom I had sent to the mountains in search of water for our next march, came back in the evening with strange tales of the natives trying to surround them and take them prisoners. They also



TRAGELAPHUS BOR (HEUGLIN).

reported very many large villages in the hills. I wished to pass around the northern end of the mountain range and proceed straight to Lado, but the reported attitude of the natives decided me on taking the southern route to Tarangole. Although there was but slight danger of not succeeding to come to friendly terms with the natives, I was particularly anxious just here to avoid any risk even of a fight, since I was near Tarangole, the most northerly point of Colonel Macdonald's expedition, where friendly arrangements had been entered into between the British Government and the native chief. Two marches brought us to Omin, a very large village near Tarangole, perched on a hill called Alanga at the foot of the mountain. During most of the morning's march crowds of natives, armed with spears and bows and arrows,

followed the caravan at some distance in an unfriendly manner. After a time, however, others more civilized from near Omin joined them, and these latter approached to within 100 yards and made friendly advances. The best course for me to pursue was to go over to these people without escort, and the result was even more than I expected. In a couple of minutes the natives were crowding round me, patting me on the back and grasping my hand in a rather annoyingly familiar manner, thus showed plainly enough that they were greatly relieved to find that we were not a hostile party of Egyptians or Mahdists, from both of whom they had received many unwelcome visits since Sir Samuel Baker's time.

At Omin we found quite a number of blacks dressed in loose white cotton suits, such as are worn by Sudanese townspeople, or occasionally in Dervish "jibbas." Each man who wore any clothing carried some old musket or rifle, of which he was immensely proud, even though the weapon were useless. The people were all under the chief Amara of Tarangole and Loguren, who only allowed those who carried rifles to wear clothing, or who, in other words, gave to any bit of cloth the dignity of a uniform. Whenever a man laid aside his rifle he also disembarassed himself of all clothing. There were strangers here from many Sudanese tribes, some of them deserters from the Khalifa's forces after the Belgians had destroyed the Dervish influence on the upper Nile.

It was an agreeable change to meet natives who had some knowledge of Europeans, and with whom we could converse through the medium of Arabic. The great strength of the people, however, lay in the magnificent physique, pluck, and skill in the use of the spear and bows and arrows of the proud young men who never knew the use of cloth, and who do not imagine that there is a power on earth equal to that of their king Amara. The one great ornament of these warriors is a heavy helmet made of brass plates, laid together on a frame of interwoven grasses. It has the appearance of a solid brass Crusader's casque, and when worn easily by jaunty and graceful warriors the effect is most striking.

We spent nearly two days at Omin, during which time I arranged for a rendezvous with chief Amara, at a village called Lorkale, some 6 miles north of his capital Loguren, and near Tarangole. Since I had now picked up many points of Colonel Macdonald's survey, and found them to have been relatively very correct, as were those of Major Austin at Rudolf, I dropped my triangulation after leaving Omin, and carried on my chartographical work to the Nile by means of a pocket compass and dead reckoning. I had wrongly judged that the country to the west of Tarangole had been thoroughly explored by Emin Pasha, Sir Samuel Baker, and by members of the Macdonald Expedition, but I find my map to be the only one giving any detail.

On March 2 a tramp of four hours west, principally through a highly cultivated country, brought us to Lorkale, where we were joined by King Amara in the afternoon. We were quite unprepared to receive so great a chief. Accustomed as we had been to meet with petty chiefs ruling generally but a single village, we were rather taken aback at the display made by this commander of perhaps 25,000 warriors on his visit to our camp. He was accompanied by a flag-bearer and about 200 soldiers with rifles, and clad in various kinds of uniforms, principally white with gay-coloured sashes and turbans, and by a much larger following of archers and lancers, naked except for their quick-flashing, bright helmets. Everything about Amara was "spick and span," from his dark blue uniform of a Uganda rifleman to the European saddle upon his mule.

I received him with all the honours that I could command with my insignificant though trained escort, for it was deemed a great honour that he should pay me the first visit. His curiosity as to how I had come was too great, however, for him to wait until I called on him. It took him a long time to grasp the fact that we had not wandered either from Uganda or Egypt; and from the many questions he asked, it was apparent that the fact that we had come directly from the far East exercised a great moral influence over him, which I was pleased to think could not be otherwise than for the good of European interests on the upper Nile.

In return for the many presents which I made him, he gave me much durrha flour, honey, and ground nuts, but it was not until I had bidden him accept a large leopardine blanket that covered my bed that his heart really warmed towards me. I am sure he has never owned anything which pleases him more than this rug, which resembles the skin of some marvellous species of the cat family. Not only did the king at once send for an escort and guides for us, but he insisted on having a large tusk brought me from his village, to my regret, for I am afraid a poor native had some of his bones broken in consequence, if he did not fare worse. This man had made a mistake, and instead of bringing the tusk the king had ordered, he arrived at midnight with two ridiculously small cow tusks. Amara was so enraged that, picking up one of the latter, he began beating the wretched messenger in a terrible manner.

The smiling chief had suddenly turned into such a ferocious brute that when I endeavoured to prevent his killing his subject, he at first turned upon me a pair of eyes so full of passion that I feared lest he might deal his next blow at me, but I pretended that I had only interrupted him to praise the two small tusks, with which "I would be delighted," etc., and thus managed to quiet him. The unconscious body of his victim was almost hurled out of camp, and others sent to bring the proper tusk, which did not arrive until two o'clock in the morning.

Amara was a splendid specimen of a Sudanese, over 6 feet in height, very broad and muscular, and with a strong, handsome face. But for his outburst of passion, which lasted but a minute, I should have thought him most cheerful and amiable.

Two long marches on March 3 and 4 brought us to a village where we were visited by a lady chieftain. I followed out my custom of offering a chair to a recognized chief, but I must confess the position was rather strange to me to be sitting with a well-formed young lady clad in the same manner only as Gunga Din, and talking over weighty affairs involving the welfare of her subjects with the latter. Her name was Kari, but she behaved herself in such a dignified manner as to preclude any idea that she would have recognized a name such as Caroline. The day after this we reached the village of the chief Uri Sube, the last of the villages under King Amara. From here on until we reached Loker we found ourselves in territory belonging to the Lukoyu, who inhabit principally the hills to the south, and possess but a few scattered hamlets in the bushy, wild plain through which we passed. We had much difficulty in cutting our way through the low forests and dense bush, occasionally getting tangled up in bamboo jungles, which we here encountered for the first time.

I heard from Amara that there was an Englishman stationed on the east bank of the Nile considerably south of Lado, so I abandoned my intention of going to the Belgians on account of the pleasure I felt it would give me to talk once more to an English officer, not dreaming that I could not enjoy the same benefit in the Uganda Protectorate that all civilized countries extend to visitors—that of being able to leave my valuables in bond at a frontier post, if I did not intend to enter them in the country. I firmly anticipated finding the Nile open, so that I could take my outfit to Cairo either in steamers or canoes. The first great disappointment came at Loker's, a large settlement situated almost on top of the long mountain which can be seen from the Nile 25 miles east of Fort Berkeley or Rejaf. On reaching here on March 10 we were informed that no steamers had come up the Nile, and that, furthermore, there were no canoes to be had. We were all cut up by the news, for my transport had already given out, and I was obliged to leave thirteen loads with the chief Loker to hold until I sent back for them. However, we reached Fort Berkeley on March 14, 1900, and although I was much pained at the extortions which were enforced upon me by the Government, according to Uganda Protectorate regulations, I shall never regret having touched an English outpost, from the simple fact that I met Captain Wm. K. Dugmore of the Uganda Rifles, and remained with him as his guest for nearly seven weeks.

I only wish I could look upon some other officials with whom I came in contact at Aden and Berbera with nearly the same respect as I do my good friend and hospitable host at Fort Berkeley. Learning from

despatches to Captain Dugmore, three months old, that "sudd" cutting had been begun on the Nile, I kept my men for nearly a month at the post, hoping that a steamer would come up the river and take us out *viâ* Omdurman. But on April 13, I found it necessary to send Mr. Frazer with all my men to Mombasa, except my cook and my bright Gurkha orderly, Hasap Singh. Famine was raging throughout the upper Nile districts, and had it not been for the great kindness of the Belgians in giving me grain, I could not have kept my men at all. I was obliged to remain longer myself, since I could get no transport for my collections and kit; and I had just made arrangements with the Belgians to go down



THE NILE AT FORT BERKELEY.

the Congo, a journey of four months in the rains, to the west coast, when, to my joy, Major Peake turned up in a gunboat, after having cut through the "sudd," and most kindly took me away with him on May 5, on his homeward journey of 1100 miles to Omdurman.

I reached Cairo the beginning of June, just ten months from the time of starting from the Somali coast for the interior, and a fortnight later found me in London with my collections safely installed at the British Museum of Natural History, to which I am presenting the most valuable of my specimens. The Academy of Natural Sciences of Philadelphia will also receive a large share. The collections include several hundred different species of birds, mammalia, plants, reptilia and batrachia, fishes, butterflies, etc.—a good number of them new to science.

I am much indebted to the Indian Survey Department for the loan of a valuable set of surveying instruments, by which I was enabled to lay down in detail over 500 miles of previously unmapped country between occasional known lines.

Before the reading of the paper, the President gave his introductory address (see p. 597). After the paper—

Major R. G. T. BRIGHT said: I have listened with very much interest to Dr. Donaldson Smith's paper. It is, perhaps, doubly interesting to one who has had the good fortune to pass over much of the country which he has traversed. Judging from the amount of water which Major Austin and I found in the country south of the Sobat, when at the beginning of this year we tried to make a journey to Lake Rudolf, I am inclined to agree with Dr. Donaldson Smith in his surmise that at one time the Nile, the Sobat river, and Lake Rudolf were one vast inland sea. In 1898 I was at the north of Lake Rudolf with one of the columns of Colonel Macdonald's expedition; there were then a few wretched natives, where, but a short time before, there had been a very rich and prosperous community. These natives at the time were suffering from famine, and an epidemic of small-pox. I am, therefore, not surprised to hear that now there are but few inhabitants in that part. This is due to the so-called civilizing raids of the Abyssinians. Dr. Donaldson Smith will, I am sure, not rest long. He has already led several expeditions to a successful issue, and I wish him, as in the present case, safe and many happy returns.

Dr. BOWDLER SHARPE: Dr. Donaldson Smith has on his former, as on his present expedition, greatly benefited zoological science, and his discoveries are quite on a par with the wonderful new facts which he has brought from the countries through which he has been. You have heard from the paper that we have at the Natural History Museum five new specimens of mammalia. I have not quite finished the birds, but there are certainly some new species, and many of great interest, especially from that new part of Africa which has not been visited by a naturalist before. I need hardly say that the British Museum thanks him on this occasion, as it has on former occasions, for not having forgotten zoological science. He has presented us with those specimens which we before had not in the Museum.

The PRESIDENT: Dr. Donaldson Smith's paper is certainly one of peculiar interest, even apart from his description of a new and almost entirely undiscovered region. I was particularly struck by the remarks (very important remarks, I think) he made respecting the meteorology of this country. The desert lands, especially to the eastward, are caused by the winds from the north blowing over the mountains of Abyssinia, and being thus wrung perfectly dry, coming down on their southern sides as dry winds. This no doubt accounts for many phenomena connected with the regions south of Abyssinia; but it requires a great deal more careful study, and this is a point of some importance, as the country will hereafter become a British settlement. Possibly connected with this question is the very remarkable fact that the whole fauna, both birds and mammals, appears to change as soon as Lake Rudolf is passed. There is a different fauna on the eastern to that on the western side. In considering the paper of Dr. Donaldson Smith, all these points give rise to reflection; but we get very little idea of the important geographical work he has done from simply listening to his paper, even when taken in conjunction with the paper he read to us a few years ago. He has not only explored a new region, but has done so with the greatest care; and has made a

most valuable series of surveys by triangulation. He produced on his first journey a number of extremely valuable maps, and will, I have no doubt, do the same with regard to his latest journey. He has also made, as Dr. Bowdler Sharpe told us, a most important collection of specimens of mammals and birds, as well as of batrachians and other lower forms. All this, I think, places Dr. Donaldson Smith in a very high position as an explorer of unknown countries, and I think that he deserves the highest praise that can be bestowed on him by geographers. I now propose a very cordial vote of thanks to Dr. Donaldson Smith, which I feel sure will be carried unanimously.

NOTE ON DR. DONALDSON SMITH'S MAP.—Heights determined by many boiling points, as well as aneroid observations. As far as Lake Stefanie the positions were determined by triangulations based on points fixed by me in 1895, aided by frequent astronomical observations with theodolite, three chronometers, and sextant. Between Lake Rudolf and Tarangole I depended upon triangulation almost entirely, aided by occasional astronomical observations for latitude. The base for this was plotted in the vicinity of the northern end of the lake from my previous observations, from a new set of measurements, and from points laid down by Major Austin.—A. D. S.

THE VOYAGES OF DIOGO CÃO AND BARTHOLOMEU DIAS, 1482-88.*

By E. G. RAVENSTEIN.

WHEN Prince John, on August 26, 1481, and at the age of twenty-six, ascended the throne of his father Affonso, he found the royal treasury empty, and his ambitious nobles, jealous of their feudal privileges, ever ready to defy the authority of their king. But John was strong and energetic where his father had been weak and vacillating, cautious where he had been rash and regardless of consequences. Wise measures of administration once more filled the royal coffers, and a strong hand crushed the nascent conspiracy of the nobles.

The Guinea coast by this time had been explored as far as Cape S. Catharina. Lopo Gonçalves had been the first to cross the line; Fernão Po is credited with having discovered the Ilha Formosa, which now bears his name, in 1472; whilst Ruy de Sequeira, "about the same time," according to Galvão,† followed the coast as far as Cabo de S. Catharina (November 25), and also discovered the islands of S. Thomé (December 21) and S. Antonio (January 17).‡ This last subsequently

* The substance of this paper was communicated at the Toronto Meeting of the British Association in 1897. For a notice of the maps referred to, see the Appendix. Maps, p. 712.

† Antonio Galvão (b. 1503, d. 1557), 'The Discoveries of the World' (1555, London; Hakluyt Soc., 1862), p. 75.

‡ Faria e Sousa ('Asia Portuguesa' (Lisbon, 1675), i. p. 18; iii. p. 529) credits João de Santarem with having explored the coast as far as Cabo de S. Catharina in 1471—a most unlikely thing to have happened. Lopez de Lima ('Ensaio sobre a

became known as Ilha do Príncipe, that is the island of Prince John, the future King John II., who had enjoyed the revenues of the Guinea trade ever since 1473.*

The Guinea trade by this time had become of importance, but since the termination in 1475 of the monopoly granted to Diogo Gomes nothing had been done to expand it; nor had steps been taken to render effective the claims to sovereignty put forth by Portugal. Hence foreign interlopers made their appearance on the coast, and during the unfortunate wars with Castile (1475-80) entire fleets sailed from Spanish ports to share in the profits of the trade there.

One of the first measures taken by King John was to put a stop to these irregularities. Royal ships were sent out to protect Portuguese interests, and on January 20, 1482, Diogo d'Azambuja † laid the foundations of the famous *Castello de S. Jorge da Mina*, which was the first European settlement on the Gold Coast, and the centre of Portuguese activity up to 1637, when it was captured by the Dutch.

THE FIRST VOYAGE OF DIOGO CÃO, 1482-84.

When King John had thus attended to what he conceived to be his more immediate duty as a king and ruler, he took up the long-neglected work of his uncle Henry, for he was both "a good Catholic, anxious for the propagation of the faith, and a man of an inquiring spirit, desirous of investigating the secrets of nature." ‡

Diogo Cão, whom the king selected to initiate this work of exploration, was a "man of the people." Genealogists have provided him with a noble pedigree, but he was in truth the descendant of one Pedro Affonso Cão, or Cam, who, in the days of King Diniz (1279-1324), had been one of the bailiffs of *Villa Real in Traz os Montes*, and of his wife, *Briolanja da Nobrega*.§ In the patent of nobility of 1484,|| by which the king "separated him from the common herd," the past services of

Statistica das Possessões Portuguezas (Lisbon, 1844), ii. p. v.) makes him at the same time the discoverer of the Guinea islands, including Annobom, or New Year's island. This island, however, was only discovered at a much later period, and independently of the other islands, for it is absent from Soligo's chart (1485), and is shown on early charts as lying to the south or even south-east of St. Thomé, when it really lies to the south-west. The island was no doubt discovered by a ship attempting a "short cut" across the Guinea gulf, and carried upon it by the equatorial current. If Duarte Pacheco Pereira (b. 1450, d. 1533) (*'Esmeraldo de situ orbis,'* p. 78) tells us that S. Thomé and S. Antonio were "discovered" by King John, we may be permitted to assume that this "discovery" took place when King John was still heir-apparent.

* For documents proving this, see *'Annaes mar. e col.'* v., 1845, p. 38.

† Luciano Cordeiro, *'Diogo d'Azambuja.'* Lisbon, 1892.

‡ Ruy de Pina, *'Chronica d'El-Rei D. João II.'* (Lisbõa, 1792), ii. t. 57, p. 144. (Ruy de Pina and Garcia de Resende were cavaliers of King John's household.)

§ See Siera de Sanchez de Baena (*Boletim Lisbon Geogr. Soc.*, 1886, p. 55) and Luciano Cordeiro (*ib.*, 1892, p. 109).

|| See this patent in full in L. Cordeiro's *'Diogo Cão'* (1892), p. 75.

the recipient of the honour are referred to, and also those of his valiant father, Badalhouce, and of his grandfather, Gonçalo Cão, who may have fought in the famous battle of Aljubarrota (1385), when the Castillian pretender was routed, and the king, duly elected by the Cortes, got his own. Among the services rendered by Diogo Cão himself may be instanced the capture of three Spanish vessels on the Guinea coast in 1480.*

We do not know whether Cão was given the command of one or of more vessels, nor have the names of any of his officers been placed on record. But when we turn to ancient maps, we meet with a Rio do Infante, a Golfo de Alvaro Martins, a Cabo de Pero Dias, a Rio de Fernão Vaz, an Angra de João de Lisboa, an Angra de Ruy Pires, and a Serra de Corte Real. There can be no reasonable doubt that the names attached to these bays, capes, or rivers are those of persons who were with one or more of the expeditions engaged in the discovery of these coasts. Of João Infante, Alvaro Martins, and Pero Dias, we know that they were with Dias, and may previously have been with Cão. João de Lisboa won great distinction in the course of time, and in 1525 was appointed *Piloto mór* of India. Unfortunately, he died the year after.† Fernão Vaz may have been the pilot who, in 1486, witnessed the agreement between Fernão Dulmo and João Affonso do Estreito about the search for the *Sette citades*; who got into disgrace for poisoning his wife, and was himself poisoned by his mistress in 1502.‡ The name of *Côrte Real* we find on Behaim's globe only, and as the *Côrte Reaes* of Terçeira were a family of seamen, it is quite possible that a member of it may have joined one of these expeditions, perhaps Gaspar, the alleged discoverer of "terra nova." It is, however, quite possible that Behaim merely intended to pay a compliment to a family with whom he was distantly related.§ Of Ruy Pires we know nothing.

Cão was the first to carry "padrões," or pillars of stone,|| on an exploring voyage. Up to his time the Portuguese had been content to erect perishable wooden crosses, or to carve inscriptions into trees, to mark the progress of their discoveries. King John conceived the happy idea of introducing stone pillars, surmounted by a cross, and bearing, in

* For an account of this capture by Eustache de la Fosse of Doornick, who was in one of the Spanish vessels, see Duro (*Bol. Geogr. Soc. of Madrid*, 1897, pp. 193-195).

† Sousa Viterbo, 'Trab. naut. dos Port.,' i. pp. 187, 255.

‡ Sousa Viterbo, *loc. cit.*, p. 304.

§ Behaim's brother-in-law, Jobst Hürter, junr., married the youngest daughter of Fernão Vaz de *Côrte Real*. See E. do Canto, 'Os Corte-Reaes' (*Ponta Delgada*, 1883), p. 23.

|| On these *padrões* see two 'Memorias,' by A. Magno de Castilho (Lisbon, 1869 and 1871), and Luciano Cordeiro, "Diogo Cão" (*Boletim Lisbon Geogr. Soc.*, 1892).

addition to the royal arms, an inscription recording in Portuguese, and sometimes also in Latin, the date, the name of the king by whose order the voyage was made, and the name of the commander. The four *padrões* set up by Cão on his two voyages have been discovered *in situ*, and the inscription upon two of them (one for each voyage) are still legible, notwithstanding the lapse of four centuries, and have been deciphered.

During the first voyage two *padrões* were set up—one at the Congonmouth, the other on the *Cabo do Lobo* in lat. $13^{\circ} 26' S.$, now known as Cape St. Mary. The latter has been recovered intact. It consists of a shaft 1.69 m. high and 0.73 m. in circumference, surmounted by a cube 0.47 m. in height and 0.33 m. in breadth. Shaft and cube are cut out of a single block of *lhoz*, a kind of limestone or coarse marble common in the environs of Lisbon. The cross has disappeared, with the exception of a stump, from which it is seen that it also was of stone, and fixed by means of lead.



THE ARMS OF PORTUGAL
UP TO 1485.

The arms of Portugal carved upon the face of the cube are those in use up to 1485, in which year João II., being then at Beja, caused the green cross of the Order of Avis, which had been improperly introduced by his grandfather, who had been master of that order, to be withdrawn and the position of the *quinas*, or five escutcheons, to be changed.*

The inscription covers the three other sides of the cube. It is in Gothic letters and in Portuguese, and reads as follows:

"In the year 6681 of the World, and in that of 1482 since the birth of our Lord Jesus Christ, the most serene, most excellent and potent prince, King D. João II. of Portugal did order (*mandou*) this land to be discovered and these *padrões* to be set up by D^o Cão, an esquire (*escudeiro*) of his household." There is no inscription in Latin.

As the year 6681 of Eusebius begins on September 1, 1481, we gather from this inscription that the order for the expedition was given between January and August, 1482. Of course the departure may have been delayed, but the delay cannot have been a long one, as Cão was home again before April, 1484.

* See Ruy de Pina, '*Chronica d'El-Rei D. João II.*' (Lisbon, 1792), p. 64; García de Resende, '*Chronica*' (Lisbon, 1752), p. 27. The exact date when the change was made is not given, and Sr. José Bastos, the learned keeper of the Torre do Tombo, informs me that there are no documents in his charge which would enable him to settle the point. The change was obviously made prior to the introduction of the new coinage in June.

Further light is thrown upon Cão's first voyage by a chart of Cristoforo Soligo, evidently drawn immediately after his return, a notice of which we give in the Appendix. Apart from this, we are dependent upon João de Barros and the chroniclers Ruy de Pina and Garcia de Resende.*

Cão may thus be supposed to have left Lisbon about the middle of 1482—say in June. He called at S. Jorge da Mina for supplies, and then made straight for Cabo de Lopo Gonçalves. His progress south along this coast was necessarily slow, for the current sets to the northward, the winds are southerly, and the surf is heavy. Only on rare occasion is the mariner favoured with a current setting to the south. He is dependent, therefore, for his progress upon a judicious use of land and sea-breezes. Leaving behind him the Cabo de S. Catharina, with its "tree" marking the furthest point reached by the seamen employed by Fernão Gomez, the Cape of Pedro Dias,† and the wooded hills of the Holy Spirit, Cão seems to have made a first stay in a bay merely described as "Angra" on Soligo's chart, but named Gulf of Alvaro Martins on others, and now known as Mayumba bay. He then left behind him a country of heavy rains and most luxuriant vegetation, and entered upon a region occasionally actually arid. Passing beneath the Paps of Bamba (*os duos montes*), and along a coast for the most part cliff-bound, he entered the Bay of Loango, which must have taken his fancy, for he called it *Praia Formosa de S. Domingos*. It is possible that he arrived here on that saint's day, that is on August 4. Passing thence to the south, and along fine red cliffs (*barreiras vermelhas*), Cão became soon aware that he was approaching a large river, for when still 5 leagues out at sea—as a legend on Soligo's chart tells us—he found the water fresh—by no means an exaggeration, for islands of floating vegetation coming out of the Congo have been encountered 100 miles from its mouth, and 9 miles to seaward the surface water is quite fresh.‡

Great must have been the astonishment—nay, terror—of the natives when for the first time they saw rising above the horizon the sails of a white man's vessel, and beheld the bleached faces of its inmates. Cão sailed up the river § for a short distance, and at once entered into friendly relations

* According to Ruy de Pina, Cão's first voyage was undertaken in 1485-86; according to Barros ('Da Asia,' Dec. I., liv. iii. c. 3), in 1484-86. Both suppose Cão to have gone no further south than the Congo.

† Corrupted into Pedras point.

‡ 'Africa Pilot,' Part ii. (London, 1893), p. 154.

§ The Congo seems at first to have become known as Rio do Padrão, and river of the Mani Congo; but Duarte Pacheco already knows one of its native names, Nzadi, though in the corrupted form of Emzaze.

with the natives. Physically, they resembled the negroes of Guinea, but the interpreters whom Cão had with him failed to make themselves understood. The natives came freely on board to barter cloth in exchange for ivory, and gave their visitors to understand by signs that far in the interior there lived a powerful king. Cão at once despatched some Christian negroes to this king as his ambassadors. They were, as a matter of course, the bearers of suitable presents,* and were instructed to assure the king of the friendly intentions of his visitors from Portugal, and of their desire to trade. The native guides promised to bring these messengers back within a certain number of days.

Before leaving the Congo for the south, Cão set up the first of his *padrões*, emphatically called "the first" on Canerio's chart. It stood on Shark point (and not on Padron point of our chart), and was dedicated to S. Jorge, a saint for whom King John felt a "singular devotion." We learn from Fathers Cavazzi and Merolla† that the Dutch, when they occupied the Congo in 1642, wantonly destroyed this memorial of Portuguese enterprise. Merolla, who saw the fragments in 1682, was able to trace the royal arms and an inscription, of which unfortunately he made no copy. A tall wooden cross was subsequently erected on the spot where the pillar stood, and an oratory built near it where masses might be said.‡



THE PADRÃO OF SÃO
JORGE.

The fragments of the *padrão* were appropriated by native priests, who looked upon them as most potent fetishes. Sr. Sori saw them in 1859;§ Burton visited the locality in 1863;|| and Baron Schwerin, guided by Sr. F. J. de França, did so in April, 1887. The baron caused the bandages in which the fragments were wrapped up to be removed, in honour of which event the *Massabi*, a Portuguese gunboat, fired a salute.

* The damask petticoat which the king wore when he received Ruy de Sousa in 1491 is said to have been given him by Cão (Barros, 'Asia,' t. I. i. p. 231).

† Cavazzi, 'Istoria descrizione de tre' regni Congo,' etc. (Bologna, 1687), p. 319; Merolla, 'Relatione del viaggio nel regno di Congo' (Napoli, 1692).

‡ This plain statement disposes of the absurd story told by the Portuguese in 1859, according to which the *padrão* was broken by cannon-balls fired from an English ship, and that its fragments would have found their way to the British Museum had not the boat in which they were being conveyed on board capsized. (L. Cordeiro, *Boletim Lisbon Geogr. Soc.*, 1892, p. 152; and *Transactions South African Philos. Soc.*, 1898, p. 298.)

§ Sr. Sori's 'Descobrimientos dos Portuguezes nos Seculos, xv. e xvi.,' we were unable to obtain, and we take this information, together with our illustration, from Castilho's 'Os Padrões' (Lisbon, 1869), p. 17.

|| Burton, 'Two Trips to Gorilla Land' (London, 1876), i. p. 59.

Mr. Dennett* examined the fragments in May of the same year. There were two large pieces, as shown in our illustration, and two ball-shaped pieces, 7 and 9 inches in diameter, lying at their foot. The material was a coarse white marble. The two larger fragments are now in the museum of the Lisbon Geographical Society.

The very hideous monument set up in 1859 by Sr. Sori was fortunately washed away by the sea in 1864. It was replaced, in 1892, by a memorial of better design, but still vastly inferior to the original *padrão*.

It is to be presumed that Cão, when, after a delay which may well have extended over several months, left for the south, was able to gain a fairly complete knowledge of the coast, for his progress must have been slow. We know from Soligo's chart that he discovered a river, which he named after Fernão Vaz,† as also the low sandy *Ilhas das Cabras* (Goat islands), off the modern city of Loanda.

Making a long stretch from the coast, Cão never noticed the most important river along the coast, the Kwanza, although its clayey waters discolour the sea for 10 or 15 miles. It is curious that none of his immediate successors should have been more fortunate. The river is not mentioned in Pacheco's 'Esmeraldo,' and is apparently shown for the first time on a chart of P. Reinell, who already knew its native name.

A remarkable headland, which from some bearings appears as a double peak, was appropriately named by Cão, "A terra da duas Pontas." It is now known as the "Morro," or hill, of Old Benguella. Further south, Cão seems to have examined the mouth of the Catumbela, for Rio do Paul—river of the swamp—is a very appropriate name for a river which, after the rains in March and April, overflows its banks and converts a great extent of country into a swamp or marsh. As Cão called the bay to the south Angra de St. Maria, he may have been in the vicinity of this river on Lady Day, March 25, 1483.

The bold granitic cliffs immediately to the south of Ponta Choca (13° 17' S.) became known as *Castello d'Alter pedroso*;‡ and about 10 miles beyond, on a low point, which he called "Cabo do lobo" (seal point), Cão erected his second *padrão*, which was dedicated to St. Augustin, from which it must not be inferred that it was erected on August 28, as these dedications were made in Portugal. At the back of this cape, now known as St. Mary (13° 26' S.), rose a *Monte negro* (black mountain), and Pacheco§ tells us that it was called *Ponta negra*, or *Preta* (both meaning black point), because of a "black" trump, "*manilha negra*," which was played here in a game of manille. This

* Dennett, *Jour. Manchester Geogr. Soc.*, iii., 1887, p. 122.

† The river Dande. It is shown on Soligo's chart.

‡ Alter pedroso is a village near Portugaleta, belonging to the Order of S. Bento; Diogo d'Azambuja was commander of this village ('Esmeraldo,' p. 68).

§ 'Esmeraldo,' p. 85.

padrão has already been described by us. It was the second and last set up during this voyage, and Soligo's chart correctly describes it as "o ultimo padrão."

When Cão returned to the Congo, he was annoyed to find that the messengers whom he had despatched to the king had not yet returned, although they had been absent double the time expected. Cão, who was naturally anxious to return home with a report of his discovery of what seemed a powerful kingdom, therefore seized four native visitors to his ship as hostages, giving their friends* to understand that after the lapse of fifteen months he would bring them back and exchange them for his own men, who were still with the king. These latter, we learn from Ruy de Pina, had been made much of; but when the king heard of Cão's high-handed proceedings, he refused to admit them any longer to his presence, and threatened to kill them, should his own people not be restored in time.



THE COAT-OF-ARMS OF D. CÃO, 1484.

Among Cão's hostages was one Caçute, a "nobleman" in his own country, and a man of some intelligence, who seems to have picked up Portuguese rapidly. King John was much pleased with this man, and the information which he was able to give. He, as well as his companions, were treated with much distinction, and dressed in fine cloth and silk!

Cão came back to Lisbon probably in the beginning of 1484, and certainly before April of that year. The king, first of all, made him a "cavalleiro" of his household. He then, on April 8, 1484, "in consideration of the services rendered in the course of a voyage of discovery to Guinea, from which he had now returned," granted him an annuity of ten thousand reals, to be continued to one surviving son; and a few days afterwards, on April 14, he separated his "cavalier" from the common herd and made him noble, and gave him a coat-of-arms charged with the two padrões which he had erected on the coast of Africa.†

* Garcia de Resende, 'Chronica,' c. 155, p. 68, says "certain months;" but Ruy de Pina, 'Coronica,' c. 56, p. 146, and Barros, 'Da Asia' (Lisbon, 1778), t. I. i. p. 174, say fifteen months.

† These documents, which prove absolutely that Cão was back from his first voyage before April 1, 1484, were first published by Albano da Silveira in 'Annaes mar. e col.' v., 1845, p. 37. L. Cordeiro republished them in the *Boletim*, 1892, p. 159.

Coat-of-arms: Field *vert*, charged with two columns *argent*, each rising upon a

THE SECOND VOYAGE OF DIOGO CÃO, 1485-6.

The materials for writing a history of Cão's second expedition are even less complete than those available for the first. There are the *padrão* of Cape Cross with its inscription, an important legend on the chart of Martellus Germanus, and the narrative of Martin Behaim, who claims to have commanded one of the vessels. Apart from these, we are dependent upon the accounts given by Ruy de Pina and João de Barros, for none of the later historians seem to have had access to original sources.

The narrative of Behaim, as gathered from the legends on his famous globe, and a paragraph in Schedel's '*Liber Chronicorum*,' printed at Nürnberg in 1493, during Behaim's presence in that town, is as follows:—

In 1484 King John sent two vessels to the south, one being commanded by D. Cão, the other by Martin Behaim. They carried, in addition to goods for barter, eighteen horses with splendid harness, intended as presents for Moorish (*i.e.* Negro) kings. They traded with the Jolof and on the Gambia; visited King Furfur's land,* 1200 German leagues from Lisbon, where the Portugal pepper grows, and came to a country where they found cinnamon. They also discovered Prince's island, S. Thomé and Martin (Behaim's!) islands (*i.e.* Annobom). On January 18 they set up a column on Monte Negro (Cão's third pillar in 15° 40'). Having sailed 2300 leagues, they set up another pillar on Cape Ledo.† They were again with their king after an absence of 19 (16 or 26) months,‡ having lost many men from the heat, and bringing pepper, grains of paradise, and many other things in proof of the discoveries they had made.

We have elsewhere § considered the trust-worthiness of this account of Cão's expedition, and arrived at the opinion that Behaim did not accompany Cão, but may have been on the Guinea coast with an expedition such as that of João Affonso d'Aveiro.

Far more useful for our purpose is the pillar which formerly stood

hillock, and surmounted by a cross *azure*. Crest: the two columns crossed and tied with a ribbon *vert*. Our illustration is taken from the '*Thesouro de Nobreza*,' of Francisco Coelho, 1575, as published by Luciano Cordeiro.

* King Furfur's land is clearly Benin, whence d'Aveiro, in 1486, brought the first Guinea pepper to Portugal. Behaim's cinnamon must have grown in Ptolemy's apocryphal Cinnamoniphera Regio.

† 2300 leagues on Behaim's globe actually carry us to a Cape Ledo, which critics may be forgiven for identifying with Dias' furthest.

‡ Nineteen months on the globe, 16 in the German, 26 in the Latin version of the chronicle.

§ Ravenstein, '*Martim de Bohemia*' (Lisbon (Ferin), 1900), pp. 25-35.

on Cape Cross, and which Captain Becker of the *Falke* carried off to Kiel* in 1893. Dr. Scheppig has fully described the pillar.†

The shaft is 1·84 m. long, and has a circumference at the bottom of 0·93 m. It tapers slightly towards the top, and is surmounted by a cube 0·43 m. high, 0·45 m. broad, and 0·26 m. thick. The whole is hewn out of a single block of marble. The cross, also of marble, was fixed by means of lead. The arms carved on the face of the cube are those adopted by John II. in 1485. There are two inscriptions in Gothic characters, the one in Portuguese, the other in Latin. The Portuguese inscription says—

“In the year bJMbjolxxxb (6685) of the creation of the world, and



THE PADRÃO OF CAPE CROSS.



THE ROYAL COAT-OF-ARMS, 1485.

of Christ llllelxxxb (485), the excellent, illustrious King D. João II. of Portugal did direct this land to be discovered, and this padirão to be set up by D^o Cão, a cavalleiro (knight) of his household.”

The Latin inscription reads as follows:—

“There had elapsed 6684 (5?) years since the creation of the world, and 148— since the birth of Christ, when the most excellent and most serene King, D. João II. of Portugal . . . ordered this column to be set up by his knight (*militem*) Iacobus Canus (*i.e.* Diogo Cão).”

Dr. Scheppig observes that the dates in this Latin inscription are both written in Arabic characters, “which, owing to their novel form, were still sources of frequent error and confusion,” and that the fourth

* The German Emperor has since caused an exact copy of it to be erected, substituting granite for marble.

† *Annalen der Hydrographie*, 1893, p. 190; *Marine Rundschau*, 1894; *Times* December 27 and 31, 1894; and L. Cordeiro, “O ultimo Padrão de Diogo Cão” (*Boletim*, 1895, p. 885).

cipher in 6684 is certainly of abnormal shape, and may perhaps be meant for a 5, in which case both inscriptions would agree. As to "1485" no doubt whatever arises.

As the year 6685 of the Eusebian era begins on September 1, 1485, Cão must have departed after that day, and before the close of the year. As he had returned from his first voyage before April, 1484, his departure must have been delayed for reasons not known to us. Perhaps it was owing to the opposition of the Royal Councillors to further expeditions, perhaps a desire that the contemplated change of arms might be recorded on the *padrões* to be sent with the explorer.

During this voyage Cão seems to have commanded a fleet—at least, so we are told by Ruy de Pina, Garcia de Resende, and Martellus Germanus. He took with him, as a matter of course, the four men whom he had so unceremoniously carried off. These had been well treated in Portugal, and were the bearers of rich presents to their king, whom they were to invite to throw aside his idols and fetishes and embrace the only saving faith.*

It may be presumed that Cão, in the course of this second voyage, gained a fuller knowledge of the coast first discovered by him to the north of the Congo. He may thus have visited and named the bay called *Golfo do Judeu*, the Jews' bay, of old maps, either because there was a Jew on board his vessel, or, what is less likely, because he was struck with the Jewish physiognomy of some of the natives, who are absurdly supposed to keep the Jewish sabbath, when in reality they have fetishes and *Casas da tinta* like their neighbours.† He may also have entered the fine *Golfo das almadias* (Kabinda bay), still famous for its boats, as it appears to have been in the days of the early Portuguese.

There was great rejoicing when Cão entered the Congo, and it became known that the hostages whom he had carried off were on board his ship. He at once sent one of these men to the Mani Congo, to announce his arrival, and to beg that his own people should be sent down to the coast, when the other three would be released. When the man came back, Cão sent a present to the king, and let him know that he was about to follow the coast to the south, but that on his return he would seek speech with him, and hand over the presents with which he had been entrusted.‡

Passing southward along the coast, Cão landed several times for the

* I. da Costa Quintilla, 'Annaes da Marinha Portuguesa,' i. p. 197, says that the king sent an "ambassador" to the King of Congo, but Ruy de Pina (p. 147) and Garcia de Resende (p. 68) only say that he sent a "message" (*embaixada*) by these four men.

† Makoya, near Chinchosho, is one of the principal villages of these supposed Jews. See Bastian, 'Deutsche Expedition nach der Loangoküste,' ii. pp. 45, 275.

‡ All this according to Barros, Dec. I., liv. iii. c. 3.

purpose of carrying off natives who were to be taught Portuguese, so that on future occasions they might act as interpreters. Near Cape St. Bras he saw native fishgarths, and hence called that double of the Bill of Portland *Ponta das Cambóas*.*

When about 160 miles beyond the second *padrão* set up by him in 1483, he reached a second *Monte Negro*, a remarkable headland in $15^{\circ} 41'$ S., rising like an island to a height of 200 feet, and presenting a rugged black face towards the sea, and upon this he set up a *padrão*. The bay to the south he named *Angra das Aldeas*, because of two poor fishing villages. In design and size this *padrão* resembles that of Cape Cross. A trace of the royal crown is still visible, but time has obliterated the inscriptions.†

The aspect of the country had gradually grown poorer and poorer, until barren sandhills and arid rocks were all that could be seen from the sea, except at a few openings where streams or rivers had given birth to vegetation and verdure (*praias verdes*). Lofty mountains now and then were visible far inland. Passing along such a coast of low sandhills and white cliffs, Cão came past the broad Golfo da Baleia (Whale bay), separated by a "sleeve of sand" (*Manga de Areia*) from the open sea; he must have noticed the low black rocks with yellow specks, first known as *Cabo preto*; ‡ and ultimately reached a truncated cone of red sandstone, in $21^{\circ} 50'$, upon which he set up the last of his *padrões*, already fully described by us. This was one of the *Cabos do padrão* of old charts, and is now known as Cape Cross. To the south of it, on Martellus Germanus's chart, we notice a *Praia das Sardinhas* (Sardine shore), now known as Sierra bay, and a *Serra parda*, which may safely be identified with the dark and rocky cliff now known as *Cabo dos Farilhões* ($22^{\circ} 9'$ S.), surmounted by a sandy dune, and rising inland into peaks—*os montes do padrão*.

This cape, 430 leagues, or 1450 sea miles, to the south of Cape Catharina, is the furthest point reached by Cão, and if a legend on the chart of Henricus Martellus Germanus may be accepted, he died there. This legend is to the following effect:—

"This mountain, called the Black mountain [i.e. *Monte negro*, in $15^{\circ} 41'$] was reached by the fleet of [John] the second King of Portugal, which fleet was commanded by Diegus Canus, who, in memory of this

* Pacheco, 'Esmeraldo,' p. 85.

† Shaft, height, 2.01 m., circumference, 1.08 m.; cube, 0.46 m. high, 0.45 m. broad, 0.19 m. thick (L. Cordeiro, *Boletim*, 1892, and 'Diogo Cão,' p. 66). This pillar is now in the museum of the Lisbon Geographical Society, with the exception of the cross, which had disappeared. A new pillar, of poor design, was erected in its place in 1892.

‡ Subsequently as *Cabo frio* (Cold cape), because of the cold coast current which runs past it.

fact, set up a marble column, with the emblem of the cross, and proceeded onwards as far as the Serra parda, which is distant 1000 miles from the Black mountain, and here he died" (*et hic moritur*).

A "parecer," or opinion, drawn up by the Spanish astronomers and pilots who attended the congress of Badajoz in 1525, and signed by Hernan Colon, Juan Sebastian del Cano, and others, goes far to confirm this legend, for it tells us that Cão, in the course of his second voyage, discovered the coast from Montenegro as far as the Sierra Parda, where he died (*donde murio*), a distance of 200 leagues (680 sea miles).*

The distance between Cape Negro and Sierra Parda actually amounts to 435 sea miles (139 leagues, or 556 Italian or Roman miles), but if we assume the Mediterranean on the chart of Germanus (which has no scale) to measure 3000 Italian miles in length, as usually adopted, then the distance separating Montenegro from Sierra Parda on that chart would equal 1000 of these miles.

Of course, if Cão died near his last padrão, we are compelled to reject the account given by Ruy de Pina and Barros of the final stages of his expedition, and generally accepted. According to these historians, Cão returned to the Congo, had an interview with the Mani Congo, who expressed a desire for priests to convert his people, masons and carpenters to build churches and houses, labourers to break in oxen, and women to make bread, so that his kingdom might in every respect become like Portugal. He sent Caçuto, one of Cão's hostages, as ambassador to Portugal, and with him the sons of several of his courtiers, desiring that they should be taught to read and write and made Christians. At the same time he sent a present of ivory and palm cloth, the most valuable products of his kingdom.

Now, we have good reason to believe that Caçuto was received by the king in the beginning of 1489, the king being then at Beja, where he and his companions were baptized with much solemnity, the king himself, his queen, and gentlemen of title acting as sponsors.† We know, further, that Caçuto, henceforth known as D. João da Silva, was sent back to Congo with D. Gonçalo de Sousa, King João's ambassador, in December, 1490. Barros‡ says that this happened two years after he had been baptized.

It might reasonably be concluded, from these dates, that Caçuto arrived in Portugal in December, 1488, was baptized at Beja in January, 1489, and again left for Congo, after a stay of two years, in December, 1490. But if this be so, he cannot have come with Cão, for Cão, or his ships,

* Navarrete, 'Collecion,' iv. (Madrid, 1837), p. 347. Observe an omission after "el dicho cabo."

† Ruy de Pina (who may have been present at this reception and baptism), p. 149; Garcia de Resende, p. 69; Barros, 'Asia,' t. I. i. pp. 177, 227.

‡ 'Asia,' t. I. i. p. 224.

must have been back before August, 1487, in which month Dias started on his voyage, taking with him the people whom Cão had kidnapped. Nay, in all probability Cão's ships came home even earlier, say in September, 1486, for on October 10 of that year Dias seems already to have been appointed to the command of the expedition which was to make him famous for all time.*

Indeed, we are inclined to think that after Cão's death, his vessel returned straight home, and if they did so, and the Eusebian era is stated quite correctly on the *padrão* of Cape Cross, they can have been away at the outside for thirteen months, that is, from September, 1485 to September, 1486—not a long period, but amply sufficient for a voyage to Cape Cross and back, and a stay of several months on the Congo river.†

THE VOYAGE OF BARTHOLOMEU DIAS, 1487-88.

No sooner had Cão's vessels returned to the Tagus than King John whose curiosity had been excited by the reports about the supposed Prester John, brought home by d'Aveiro,‡ determined to fit out another expedition to go in quest of him by doubling Africa, Friar Antonio of Lisbon and Pero of Montaroyo having already been despatched on the same errand by way of Jerusalem and Egypt. The command of this expedition was conferred upon Bartholomeu Dias de Novaes, a cavalier of the king's household, who, if we may trust Fernão Lopez de Castanheda ('*Historia*,' liv. i. c. 1), held at the time the appointment of superintendent of the royal warehouses (*almoxarife dos armazéns*). Portuguese historians speak of this Dias as a kinsman or descendant of João Dias, who was associated with Gil Eannes in doubling Cap Bojador in 1484, and of Diniz Dias, a cavalier of King John I., whose Azurara credits with the discovery of Cape Verde in 1445, but I am not aware of any documentary evidence in favour of these assumptions. There can be no doubt, however, that Dias was a seaman of considerable experience. It may have been our Bartholomew whom King John, in 1478, when still crown-prince, in consideration of 12,000 reis expended in the purchase of a slave, exonerated from payment of the usual royalty on the ivory bought on the Guinea coasts.§ It certainly was our Bartholomew who commanded one of the vessels despatched in 1485 with Diogo d'Azambuja to the Gold Coast.

The appointment seems to have been made in October, 1486, for on

* See below.

† The embassy of 1490 reached the Congo river in one hundred days. A journey up to the capital and back need at most take forty days.

‡ João Afonso d'Aveiro in 1486 brought the first pepper from Benin to Portugal, as also information of a king Ogane in the interior, who was rashly identified with Prester John, though in truth the ruler of Ghana or of the Mosi.

§ Sousa Viterbo, '*Trabalhos Nauticos dos Portugueses*,' 1898, p. 81.

the 10th of that month King John, "in consideration of services which he hoped to receive," conferred upon Bartholomeu Dias, the "patron" of the *S. Christovão*, a royal vessel, an annuity of 6000 reis.* We shall see presently that ten months were allowed to elapse before the expedition actually left the Tagus.

The account which João de Barros has transmitted to us of the remarkable expedition which resulted in the discovery of the Cape of Good Hope † is fragmentary, and on some points undoubtedly erroneous. Unfortunately, up till now no official report of the expedition has been discovered; but there are a few incidental references to it, which enable us to amplify, and in some measure to correct, the version put forward by the great Portuguese historian.

Most important among these independent witnesses is a marginal note on fol. 13 of a copy of Pierre d'Ailly's 'Imago mundi,' which was the property of Christopher Columbus, and is still in the Columbine Library at Seville. This "note" reads as follows:— ‡

"Note, that in December of this year, 1488, there landed at Lisbon Bartholomeu Didacus [Dias], the commander of three caravels, whom the King of Portugal had sent to Guinea to seek out the land, and who reported that he had sailed 600 leagues beyond the furthest reached hitherto, that is, 450 leagues to the south and then 150 leagues to the north, as far as a cape named by him the Cape of Good Hope, which cape we judge to be in Agisimba, § its latitude, as determined by the astrolabe, being 45° S., and its distance from Lisbon 3100 leagues. This voyage he [Dias] had depicted and described from league to league upon a chart, so that he might show it to the king; at all of which I was present (*in quibus omnibus interfui*)."

The same voyage is referred to in a second "note" discovered in the margin of the 'Historia rerum ubique gestarum' of Pope Pius II., printed at Venice in 1477. From this second note we learn that "one of the captains whom the most serene King of Portugal sent forth to seek out the land in Guinea brought back word in 1488 that he had sailed 45° beyond the equinoctial line." ||

Las Casas ('Historia de las Indias,' lib. i. c. 7) assumed these notes to have been written by Bartholomew Columbus, whom, as the result

* Albano da Silveira (*Annaes mar. e col.*, v., 1845, p. 55) first published the royal rescript, since reprinted by Texeira de Aragão ('Vasco da Gama,' 3a ed. p. 24).

† 'Da Asia,' Dec. I. liv. iii. c. 4.

‡ For a facsimile, see 'Raccolta Columbiana' (Rome, 1892), pt. I. t. iii. tav. lxx., No. 23.

§ Agisymba, according to Marinus, was supposed to lie at a distance of 24,600 stadia (41°) to the south of the equator. This grossly exaggerated distance Ptolemy arbitrarily reduced by one-half, and on his map Agisymba lies beyond the Mountains of the Moon.

|| See 'Raccolta,' serie B, No. 6.

of a misconception of the meaning of the concluding words of the note, he supposed to have taken part in this voyage. These assumptions, however, are absolutely inadmissible, for as early as February 10, 1488, Bartholomew had completed at London a map of the world for Henry VII.* If we remember that Bartholomew was detained by pirates for several weeks before he reached England, he must have left Lisbon towards the end of 1487. He did not return to that place until many years afterwards.

On the other hand, the note is unhesitatingly recognized as in the handwriting of Christopher by such competent authorities as Varnhagen (*Bulletin Paris Geog. Soc.*, xv., 1858, p. 71), d'Avezac (*ibid.*, xvi., 1858, p. 268), H. Harrisse ('Fernand Colomb,' (Paris, 1872), p. 120),† Asensio ('Cristobel Colon,' i. pp. 137, 217), and Cesare de Lollis, the editor of the 'Raccolta Colombiana,' published at Rome in 1892 (pt. i. t. iii. p. ix.).

And if Christopher is the author of these notes, they must have been written in 1488, for it was on March 28, 1488, that King Manuel, in response to an application, cordially invited his "especial friend," Christopher Columbus, to come to Lisbon, promising him protection against all criminal and civil proceedings that might be taken against him.‡ Such a promise was needed, for Columbus, in 1480, stole away from Lisbon without paying 220 ducats, which he owed to certain of his creditors.§ Columbus, when he received this royal invitation, was at Seville, where his son Ferdinand was born unto him on September 28, 1488. If he left Seville soon afterwards, he may certainly have been present on the memorable occasion, in December, 1488, when Bartholomeu Dias rendered an account to the king of the results of his hope-inspiring voyage.

If, then, Bartholomeu Dias returned in December, 1488, after an absence (according to De Barros) of sixteen months and seventeen days, he must have started towards the end of July or in the beginning of August, 1487; and if the Bartholomeu Dias referred to in the royal rescript of October 10, 1486 (*v.* preceding page) is the discoverer of the Cape, which hardly admits of a doubt, he cannot have started in July,

* For the curious inscription on this map, see Las Casas, 'Historia' (Madrid), i. p. 225, and list of errata, where "anno domini quater centesimo octiesque uno atque insuper anno octavo: decimque die tum tertia mensis Februarj" is correctly rendered February 13, 1488.

† Harrisse subsequently ('Christopher Colomb,' (Paris, 1884), ii. p. 19) changed his views. He assumes, erroneously as we conceive, that Dias returned in December, 1487, and that Christopher Columbus cannot have written this "note," as he is known to have been in Spain at least up to October, 1488, but that his brother Bartholomew may have done so.

‡ For the king's letter of invitation, see Navarrete, 'Coleccion de los Viagens,' 2a ed. ii. p. 10; and Asensio, 'Cristobal Colon,' ii. p. 132.

§ In his last will and testament, dated May 19, 1506, he charged his son Diogo to pay these debts "for conscience' sake" (Asensio, 'Cristobal Colon,' ii. pp. 131-138).

1486, as usually assumed. He cannot have been in Lisbon in December, 1487.

This date (namely 1488) is further confirmed by Duarte Pacheco Pereira, the "Achilles Lusitano" of Camoens ('Canto,' x. 12), for in his 'Esmeraldo de Situ Orbis,' written soon after 1505, but only published in 1892, we are told that the Cape was discovered in 1488.* And Pacheco is a very competent witness, for Dias, on his homeward voyage, met him at the Ilha do Príncipe.†

Turning back now to Colon's "note," we find that Dias is supposed to have sailed 450 legoas, or $25^{\circ}3'$,‡ to the south of Cão's furthest; and as Cape Cross actually stands in lat. $21^{\circ}8'$, this would have brought him to lat. $47^{\circ}1'$ S. A return voyage of 150 legoas, or $8^{\circ}5'$ to the northwards, would have reduced his latitude to $38^{\circ}6'$ S. But if Colon assumed Cape Cross to be in lat. 19° S., as on Dr. Hamy's and the Cantino charts, then the highest latitude reached would have been $44^{\circ}3'$ S. We are justified in concluding from this that Colon's 45° does not refer to the Cape, but to the highest latitude reached. As to the 3100 leagues (174 degrees), the supposed distance from Lisbon, we have evidently to deal with a slip of the pen, for the distance to the Cape, following the coast, is only 6000 miles, or 100° .

A further statement respecting the date of the discovery of the Cape appears in the *Parecer*, or "opinion," of the Spanish astronomers and pilots already referred to. They say, "And beyond this [the Sierra Parda, where Cão died], Bartolomé Diaz, in the year 1488, discovered as far as the Cabo d'El-Rei, a distance of 350 leagues; and thence to the Cabo de boa Esperança, 250 leagues; and thence D. Vasco da Gama discovered 600 leagues . . ."

The distances given are exaggerations, for it seems to have been the object of these "experts" to push India and the Moluccas as far to the east as possible, so that the latter might fall within the Spanish sphere: the coast-line actually discovered by Dias measures less than 380 leagues. The nomenclature given is curious, for the designation of Cabo d'El-Rei is bestowed upon the Cape of Good Hope, and the latter name, not inappropriately, transferred to the furthest point reached by Dias. I have not come across a single chart or document bearing out this nomenclature.

* 'Esmeraldo,' pp. 90, 94. Pacheco was born at Lisbon about 1450; served for years on the Guinea coast; was to have gone, in 1498, to the West Indies; accompanied Cabral to India in 1500, and Albuquerque in 1503; heroically defended Cochim, and came back to Lisbon in 1505. He was governor of S. Jorge da Mina, 1520-22, and died 1533, having been in receipt of an annuity since 1524. (See Raphael Bastos' introduction to the 'Esmeraldo'.)

† De Barros, 'Da Asia' (Lisbon, 1778), t. I. v. ii. p. 191.

‡ Reckoning 1 degree = $17^{\circ}74'$ legoas, the legoa of 7500 varas being = 6269 m.

There remain to be noticed two references to the expedition of Dias in the 'Roteiro' describing Vasco da Gama's first voyage, for which we are indebted to Pero d'Alemquer, the pilot of Dias' flagship;* and the statement of John of Empoli, the supercargo of one of the vessels of Affonso de Albuquerque's fleet (1503), that the Bahia dos Vaqueiros of Dias was renamed Bahia de St. Braz, because it was discovered on the day of that saint.†

Dias is supposed to have erected three padrões, but only one of these has up till now been discovered; and as the inscription upon it is no longer legible, it furnishes no evidence of the date of the voyage.



FRAGMENTS OF A PADRÃO
OF B. DIAS, 1487.

This pillar stood on Dias Point, south of Angra Pequena or Lüderitz bay. Sir Home Popham saw it in 1786, but even then the inscription could no longer be deciphered.‡ Captain Vidal, in 1823, found the pillar in fragments.§ The shaft, of marble, rose originally about 6 feet above the ground and was buried to a depth of 21 inches; it was surmounted by a stone cross 16 inches high. In 1856 Captain Carr brought three fragments to Capetown, two of which, in 1865, were handed over to Chevalier du Prat, and are now at Lisbon; whilst the third, 22 inches high, 8 inches broad, and 5½ inches thick, is still in the Cape museum.|| Of the fragments now at Lisbon, the kindness of my friend Captain E. de C. e Vasconcellos enables me to publish an illustration.

The "pillars" carried away by Dias seem to have resembled those entrusted to his predecessor, Cão, except that, in addition to the royal arms, there was carved upon them a pelican, the device which King John had assumed when a prince, together with the motto, "Por tua le e por tua grey." Such, at least, would appear to have been the case to judge from the description of a series of pictures, illustrating the discovery of India, which were to have been painted by order of King Manuel.¶

* See 'A Journal of the First Voyage of Vasco da Gama' (Hakluyt Society), pp. 9, 14.

† Ramusio, i., 3rd ed., fol. 144.

‡ Rennel's 'Geography of Herodotus,' p. 698.

§ Owen, 'Narrative of a Voyage to Explore the Shores of Africa' (1843), ii. p. 269.

|| See L. Sclater's paper, with remarks by Luciano Cordeiro in the *Transactions of the South African Philos. Society*, 1898, p. 255.

¶ See 'Alguns Documentos' (1892), p. 516; and Ruy de Pina, p. 65. Duarte Pacheco, 'Esmeraldo,' p. 97, says the inscriptions upon the pillar supposed to have been erected on St. Cruz were in Latin, Arabic, and Portuguese, and that it was visible from the sea. It is quite clear to us that Pacheco never saw this padrao, for when referring to the pillars set up by Cão during his two voyages, he says likewise that the inscriptions were in three languages, when, as a matter of fact, we now know that no Arabic inscriptions were to be found upon the pillars (see *ante*, pp. 628, 634).

Apart from what can be gathered from the above, and from a few early maps, we are dependent upon De Barros for what we know concerning the voyage of Bartholomeu Dias. Other historians have either slavishly copied him, or they adduce no fresh information. Strange to say, Ruy de Pina and Garcia de Resende, the chroniclers of King John II., although they refer casually to the discovery of the Cape of Good Hope, do not once mention the name of Bartholomeu Dias. As for Correa, the author of the 'Lendas da India,' he may safely be discarded.*

Bartholomeu Dias was given the command of two ships, of fifty tons each, and of a store-vessel.† His flagship, we think, must have been a *Christovão*, perhaps the very vessel which he commanded before his departure in 1486, and again in 1490-95; or possibly a new vessel bearing the familiar name. His chief pilot was Pero d'Alemquer, an experienced seaman, who subsequently served under Vasco da Gama. The master's name was Leitão. The second ship, the *St. Pantaleão*, had for its captain João Infante, a cavalier of the king's household, with whom were Alvaro Martins as pilot, and João Grego as master. The store-vessel was placed in charge of Pero Dias, a brother of Bartholomew. João de Santiago was pilot, João Alves master, and Fernão Colaço, of Lumiar, clerk.

There were on board two negroes whom Cão had kidnapped, as also four negresses from the Guinea coast. Strict orders had been given, not only to avoid every conflict with the natives, but also to gain their confidence by gifts. The four Guinea women were to be landed at various places, handsomely dressed, and furnished with samples of gold, silver, and spices, which the Portuguese were in quest of. These they were to exhibit wherever they went, proclaiming, at the same time, the greatness and munificence of the King of Portugal, and the ardent desire which possessed him to communicate with Prester John. Women were selected for this duty, as they would be respected even in the midst of tribal wars.

Dias, we have no doubt, was furnished with a copy of the chart compiled by D. Diogo Ortiz de Vilhegas, of Calçadilha, Dr. Rodrigo, of Pedras Negras (the king's physician), and Master Moses, a Jew, which had been given in May, 1487, to Pero de Covilhã.‡

* Correa does not mention the name of Dias. According to him, Janinfante, a foreign merchant and practical seaman, had the command. Failing in his attempt to double the Cape, he maintained that vessels larger than caravels were needed to ensure success. The king at once ordered such vessels to be built, but Janinfante died, and the command was given to Vasco da Gama!

† De Barros, 'Asia,' t. I. p. i. p. 184.

‡ F. Alvares, 'Verdadeira Informação,' c. 103.

The expedition left Lisbon at the end of July or in the beginning of August, 1487, and sailed direct for the Congo, beyond which the coast was examined with attention, capes and bays being named either after saints, on account of striking physical features, or in connection with some occurrence in the course of the voyage. On reaching the Angra do Salto, which we conceive to be identical with the Golfo das Aldeas,* now known as Port Alexander, the two negroes carried off by Cão were restored to their friends. It is just possible that the store-vessel was left in this safe and commodious harbour, where fish abounded, good water was plentiful, and natives with herds of sheep and bullocks within reach.

Struggling against south-westerly winds and a current setting to the north, Dias passed the last pillar set up by Cão.† He may have named the country to the south in honour of S. Barbara, whose day is December 4, and entered on December 8 the Golfo de S. Maria da Conceição, our modern Walvisch bay. Here he seems to have tarried, for, taking the saints' names bestowed along this coast for our guide, the next locality named by him must have been the Golfo de S. Thomé (December 21), only 145 miles beyond. It cannot have taken a fortnight to make so short a run. It was probably here that the first negress was landed.

We may then suppose Dias to have sailed southward along the desolate coast of sandhills, where he possibly experienced the hot blasts of an easterly wind, and hence bestowed upon this forbidding region the appropriate name of "Areias gordas," that is, "hell." The gulf of St. Thomas was probably named on December 21, and a few days afterwards Dias arrived at the Cabo da Volta and the Serra parda, where he erected the padirão dedicated to Santiago, fragments of which have been recovered, and have already been referred to. He also landed here the second of his negresses, probably leaving her with natives who had come down to the shore to fish.‡

* Cosa's Golfo do Saco and the G. do Salto of the Cantino map refer, no doubt, to the same locality. Cosa places the name near where Port Alexander should be, whilst Cantino locates it on a barren coast between that port and Great Fish bay, not frequented even by fishermen.

† We have absolutely no direct information about Dias's proceedings from the time he left Angra do Salto to his arrival at Cabo da Volta, where he set up his first pillar.

‡ De Barros's account of this important section of the voyage is very confused. He tells us (pp. 185, 186) that the first padirão, that of Sant Lago, was set up on a Serra parda, at the Angra dos Ilheos, in 24° S., or 120 leagues (400 miles), beyond Cão's furthest. But 120 leagues beyond Cão's furthest, which Barros (p. 175) assumes to have been in 22° S., would carry us to 28° 20', or within 50 miles of an Angra das Voltas, which he places in 29° S., and which it is thought survives in Cape Volta, to the south of the Orange river, in 28° 42' S.

It seems thus that the two localities, which De Barros separates by an interval of 5°, cannot in reality be very distant from each other.

On Cantino's chart, the deep bay to the east of this cape, our modern Angra pequena, is called Golfo de S. Christovão, and this, it appears, was the name originally bestowed upon a bay which subsequently became known as Angra or Golfo das Voltas—the "bay of tacks." *

It is not probable that Dias remained long in this bay. De Barros tells us that he stood off and on for five days, when there arose a strong wind, which compelled him to reduce his sails, and before which he ran south for thirteen days. This statement we are not prepared to accept, for northerly winds are exceedingly rare along this coast, and the squalls from the north-north-east or north-north-west, which are experienced occasionally, are never of long duration. But when Dias reached a higher latitude on the south-east edge of the Agulhas bank, and came under the influence of the "roaring forties," it is very likely that he met with gales and a heavy sea, and, considering the small size of the vessels, his men are to be excused if they stood in "mortal fear;" † and they naturally suffered from the cold, for in these latitudes they experienced a mean temperature of 50° or less, which is hard to bear for men fresh from a tropical climate.

During the first period of this long stretch to the south, Dias may be supposed to have kept within sight of the coast. He may thus have named the Golfo de S. Estevão, now Elizabeth bay, on December 26, and the Terra da Silvestre on December 31. He may even have heard the roar of the rollers thundering upon the shore of the Terra dos Bramidos, ‡ and gained a view of the lofty Serra dos Reis on January 6, § but beyond these he lost sight of the land, and when passing St. Helena bay, as we learn from Pero d'Alemquer, he was far out at sea. ||

When the storm subsided, Dias stood east, and having failed, in the course of several days, to meet with land, he turned his prow to the northward. Sailing in that direction for 150 leagues, he saw lofty mountains rising before him, and came to anchor in a bay which he called Bahia dos Vaqueiros (Cowherd's bay). This happened on

* Barros, p. 186, says, "*now* known as Angra das Voltas." Of the identity of this bay with our Angra pequena there can be no doubt. It is quite true that Duarte Pacheco places the Angra das Voltas in 29° 20' S., the Strassburg Ptolemy in 28° S., and De Barros in 29° S.; but, on the other hand, Juan de la Cosa places this bay in 24° S., and the author of Cantino's chart in 26° 30' S., its true latitudes being 26° 40' S. Duarte Pacheco, in his 'Esmeraldo,' describes it as being 1 league broad at the mouth, 1½ league deep, affording a safe anchorage for a hundred vessels in from ten to twelve brasses. The only bay along this coast fitting this description, or the contours of our ancient maps, is our Angra pequena.

† De Barros, p. 187.

‡ "Bramidos" means "roars."

§ That is, mountains of the three magi.

|| See 'A Journal of Vasco da Gama's First Voyage' (Hakluyt Society), p. 9.

February 3, 1488, and as this day is dedicated to St. Blaise, the bay, so we are told by John of Empoli,* was renamed *Bahia de S. Braz*. It is the Mossel bay of our days.

We learn from Pero d'Alemquer that the natives refused the presents which were offered them, and when Dias landed to take in water from a well close to the beach, he was pelted with stones. One of the natives was killed with an arrow from a crossbow, and they then retreated inland with their cattle.

During his onward course Dias had to struggle against the *Agulhas* current, as also against the prevailing south-easterly winds. He may, however, have taken advantage of an inshore counter-current, setting eastward, as also of occasional westerly winds. At all events, he made his way along a coast bounded by lofty mountains. Rounding *Cabo do Recife* (Cape Recife), he entered a vast bay, which was called *Bahia da Roca* (Rock bay), but which is now known as *Algoa* bay. Within it lay a group of rocky islets—the *Ilhéos da Cruz*. Duarte Pacheco ('*Esmeraldo*,' p. 94) says that the tallest of this group is also known as *Penedo das Fontes* (Fountain rock) because of two springs which rise upon it, and that Dias erected a pillar there, visible out at sea. As a matter of fact, the largest of these islets is nearly all bare rock, and there are no springs. Nor does it appear, if we may accept the results of M. de Mesquito Perestrello's careful survey of this coast in 1575,† that a stone pillar was ever set up on this islet, notwithstanding the name it bears.

It is, however, possible that Dias erected a wooden cross upon it, all traces of which had disappeared when Perestrello examined the coast. The islet may have been named because it was discovered on the day of the invention of the cross (May 2). In that case Dias must have spent three months in making good the 200 miles which separate it from Mossel bay, which is difficult to believe.

Having left here the last of his negresses—one had died during the voyage—in the company of two women who were gathering shellfish along the beach, Dias continued his voyage. He sailed past the *Ilhéos chãos* (Low islands), and about 12 miles beyond them, at or near a sandy cliff, still known as *Cape Padrone*, he set up a *padrão* dedicated to S. Gregorio.‡ It is quite possible that this pillar was erected on St.

* John of Empoli sailed with Afonso de Albuquerque to India in 1503. He was supercargo of a vessel chartered by the Marchioness of Lisbon. His narrative was published by Ramusio, i. 3rd ed. f. 144.

† Published in Pimental's '*Arte de Navegar*' (Lisbon, 1762), pp. 446-456.

‡ Perestrello says the pillar stood on an islet at the foot of this cliff, the only islet between the *Ilhéos chãos* and the *Rio do Infante*, but only sunken rocks are met there now, and the islet may have been destroyed by the force of the breakers. I do not gather from Perestrello's account that he himself saw the pillar.

Gregory's day (March 12), though as a rule these dedications seem to have been made at home.

It was probably about this time, when the coast was actually seen to stretch away towards the north-east, in the desired direction, that the ship's companies began to murmur about the hardships to which they were being exposed. Dias, whose *Regimento*, or instructions, directed him to consult his officers on all occasions of importance, therefore invited them to land with him, together with a few leading seamen. The result of this council was a decision in favour of a return, and a document to that effect was signed by all present. Dias, however, persuaded his followers to go on eastward for two or three days longer, and promised that, unless something happened within that period to induce them to change their minds, he would accede to their wishes.

He was thus able to pass the remarkable rock identified by Perestrello with the Penedo das Fontes, where the dammed-up waters of a small stream soak through the beach ridge. This, I have no doubt, is Ship rock.* The Rio do Infante (Great Fish river) lies only about 16 miles beyond.† It was thus named because the captain of the *Pantaleão* was the first to land at its mouth. Here Dias turned back; Galvão ‡ says that he saw "the land of India, but, like Moses and the promised land, he did not enter it."

On passing his *padrão*, "he took leave of it as from a beloved son whom he never expected to see again." His forebodings proved true, for twelve years afterwards, when on a voyage to India in Cabral's armada, he perished almost within its sight.

During his homeward voyage Dias was favoured by winds and currents. It is almost certain that he named the Cabo do Infante, and probably that he dedicated the southernmost cape of all Africa to St. Brandan, an apocryphal Irishman, whose day is May 16.§

It was soon after this that he beheld, for the first time, and coming from the east, the remarkable group of mountains—broken land, or "terra fragosa," as the ancient maps have it—which fill Cape Peninsula,

* See 'Africa Pilot,' pt. ii. (1889), p. 126.

† Perestrello says 5 legoas, that is, 17 miles.

‡ 'The Discoveries of the World,' 1555 (Hakluyt Soc.), p. 77.

§ The Cabo (or rather Golfo) das Agulhas first appears on Cantino's chart. On all our ancient charts (2, 4, 5, 6, 7) the Cape of Good Hope is indicated as the southernmost point of Africa. Pacheco, in his 'Esmeraldo' (pp. 90, 92), places the Cape of Good Hope and St. Brandan's point in the same latitude, viz. 34° 30', and makes no mention of a Cabo das Agulhas, but in his 'Table of Latitudes' (p. 15), the latter is placed in 35° S., or 30' further south than the Cape, whilst St. Brandan's point is omitted. This almost looks as if the two names referred to the same locality.

the southern extremity of which, if we may believe Barros (p. 190), he named Cabo Tormentoso, in memory of the storms which he had experienced, a name which the king, whose hopes of reaching India by an ocean route seemed about to be realized, changed into Cabo da boa Esperança—the Cape of Good Hope.* We fancy that this is one of those pretty legends frequently associated with great events. Duarte Pacheco, a contemporary, distinctly tells us that it was Dias who gave the Cape its present name; Christopher Columbus, who was present when Dias made his report to the king, says the same. Barros, indeed, seems alone to be responsible for this legend, for if Camoens ('Canto,' v. 50) speaks of a "Cabo Tormentorio," we must remember that he lived through the terrible tempest which overwhelmed a part of Cabral's fleet. This was during the season of storms, in winter. Dias, who spent several months on the south coast, may of course have met with gales, which would justify an appellation such as "Cape of Storms." Still, on his homeward voyage, when alone he was in the immediate vicinity of the Cape, he seems to have been fortunate, for Pero d'Alemquer, his pilot, informs us that he left the Cape on a morning with a stern wind, which rapidly carried him northward.†

Before leaving the Cape, Dias erected the last of his *padrões*, which was dedicated to St. Philip.‡

After an absence of nine months, Dias rejoined his store-ship. He found that six men had been killed in a trade dispute with the natives, and Fernão Colaço, one of the three survivors, died of joy on beholding his comrades. The vessel, being worm-eaten, was burnt after the provisions had been taken out of her.

It was now about the middle of August, if we assume Dias to have parted from his store-vessel about the middle of November. There thus remained four months for making his way to Lisbon. Of what he did during these four months we know very little. We do not even know whether he called at the Congo.§ We know, however, that he touched at the Ilha do Principe, where he met Duarte Pacheco with part of his shipwrecked crew,|| all of whom he took on board; that he then touched at Rio do Resgate—trade river—where he seems to have purchased some slaves, "so as not to come home empty-handed;" that João Fogaça, the Governor of S. Jorge da Mina, placed on board his vessel the gold he had obtained by barter; and that ultimately, in

* We have already seen that, according to the Spanish pilots, the Cape was originally called Cabo d'El-Rei (see p. 641).

† 'A Journal of the First Voyage of Vasco da Gama' (Hakluyt Soc.), p. 9.

‡ The site of this pillar is absolutely unknown.

§ The question of whether it was he or Cão who brought the envoy of the King of Congo to Portugal has already been discussed, p. 637.

|| De Barros, *loc. cit.*, p. 191.

December, 1488, after an absence of sixteen months and seventeen days, he once more entered the Tagus. Dias had discovered 373 legoas or 1260 miles of coast; and his voyage, jointly with the reports received by that time from Pero de Covilhã, had demonstrated the fact that India might be reached by sea.

We are not aware that Dias ever received a reward for his great achievement. It seems not, for between 1490 and 1495 he still commanded the *Christovão*,* and when King John had overruled the objections of his advisers, who thought it unwise to expend, and possibly exhaust, the resources of the kingdom in distant adventures, which, even if successful, would raise against Portugal all those who now profited, or who in the future hoped to profit, from the India trade, it was not Dias who was placed at the head of the expedition which was to crown the enterprise started by Prince Henry. Dias was merely employed to superintend the building and outfit of the vessels intended for this expedition, the command of which was given by King John's successor, King Manuel, to Vasco da Gama.†

APPENDIX.

ON THE MAPS ILLUSTRATING THE VOYAGES OF CÃO AND DIAS.

In writing the accounts of the voyages of Cão and Dias, we have largely profited by a few contemporary maps. These maps, unfortunately, are on a very small scale. This compelled their compilers to confine themselves to a selection among the place-names which they found upon the sailing charts at their disposal, and this selection may not in all cases have been a judicious one.

Another difficulty arises from the fact that successive explorers failed to identify the places already named by their predecessors, or deliberately set aside the claims of priority. As a result, Benguella bay became successively known as Angra de S. Maria, Bahia da Torre, das Vaccas, and de S. Antonio; and Saldanha's name, instead of being attached to Table bay, is conferred upon a bay which originally seems to have been dedicated to S. Lucia.

Of course, much of this confusion is due to the utter failure of these early explorers to determine accurately the latitudes of the places they visited. José Visinho, whom King John sent to the Guinea coast in 1484 or 1485 for the express purpose of determining latitudes by observing the declination of the sun, reported that the Los islands were in 5° N., when in reality they are in 9° 30' N.; and Bartholomeu Columbus, to whom we are indebted for this information, adds that

* For an acquittance for 4,080,912 reals expended during these five years, dated February 27, 1498, see 'Alguns Documentos,' p. 19. The Bart. Dias who commanded the *Figa* in 1497 was not the great navigator, as believed by H. Lopes de Mendonça and the editor of 'Alguns Documentos,' who publishes a facsimile, p. 515.

† Dias accompanied Vasco da Gama, in 1497, as far as the Cape Verde islands, and thence sailed to the Gold Coast. He commanded a vessel in Cabral's fleet, and perished off the Cape in 1501. His grandson, Paulo Dias de Novaes, won fame as the first conquistador of Angola.

he himself found by observations with a quadrant that the Gold Coast was under the equator.*

The earliest map to which we are able to refer is to be found in a codex which originally belonged to the family of Count Cornaro-Piscopi, then found its way into the Palace of the Doges, and may now be consulted in the British Museum (Eg. 73).† The volume contains 35 charts by various draughtsmen, collected in 1489. The charts which concern us are numbered 30 to 33 (originally 28-31). No. 30 is a chart of the Atlantic coast from Cape Finisterre to Cape Verde, and is stated to be by Cristoforo Soligo, a Venetian cosmographer‡—that is, Soligo copied it from some Portuguese original. Nos. 31-33 give a delineation of the entire coast from Portugal to the “ultimo padrão,” set up by Cão on Cape St. Mary in lat. $13^{\circ} 26' S.$ In character these charts resemble No. 30, and I venture to ascribe them to Soligo or Seligo as copyist, not author.§ They were evidently drawn immediately after Cão's return from his first voyage in 1484 or 1485.

The charts are furnished with scales, but are still without parallels. A legend, written right against the mouth of the Niger, tells us “hic non apar polus,” but this invisibility of the pole-star is not borne out by the scale of the chart. Assuming 75 Italian miles to be equal to one degree, the following latitudes would result from measurements made upon the charts:—

	On Charts.		Actual position.	
Lisbon, assumed	...	$38^{\circ} 70' N., 9^{\circ} 17' W.$	...	$38^{\circ} 70' N., 9^{\circ} 17' W.$
Cape Verde	...	$15^{\circ} 37' N., 16^{\circ} 02' W.$	...	$14^{\circ} 75' N., 17^{\circ} 53' W.$
Cape Palmas	...	$6^{\circ} 17' N., 3^{\circ} 66' W.$	...	$4^{\circ} 35' N., 7^{\circ} 45' W.$
Niger mouth	...	$9^{\circ} 24' N., 10^{\circ} 33' W.$	...	$5^{\circ} 00' N., 5^{\circ} 00' E.$
Cape Lopez	...	$2^{\circ} 97' N., 15^{\circ} 13' E.$	...	$0^{\circ} 60' S., 8^{\circ} 73' E.$
Congo mouth	...	$4^{\circ} 43' S., 19^{\circ} 41' E.$	...	$6^{\circ} 07' S., 12^{\circ} 15' E.$

Our second map is by Henricus Martellus Germanus. It is one of many in a manuscript, ‘Insularium illustratum,’ now in the British Museum (Add. MS. 15,760). It is a map of the world very roughly drawn and without a scale, and is dated 1489, and thus shows the discoveries up to the return of Dias—1488. The author appears to have been an Italian, or if a German (Heinrich Hammer) he lived in Italy. Count Lavradio published a facsimile of this map of the world in 1863.

Behaim's famous globe is next in date, viz. 1492. As its author claims to have commanded one of the ships of Cão's second expedition, it might have proved of exceeding value had not the delineation of the south-west coast of Africa been intentionally falsified in order to make the Nurembergers believe that their clever townsman had doubled the cape and sailed a considerable distance beyond it.

The remaining cartographical materials available are the chart of the world by Juan de la Cosa (1500); a chart by an unknown author, now in the possession of Dr. Hamy (1502); a chart which Alberto Cantino caused to be designed at Lisbon for his patron, Hercules d'Este, Duke of Ferrara (1502); and a chart by Nicolas de Canerio of Genoa (1502). For an account of these charts, I refer to ‘A Journal of the First Voyage of Vasco da Gama,’ published by the Hakluyt Society in 1898, pp. 205-211.||

* *Raccolta Columbiana*, I. t. iii., Serie B, No. 861; Serie C, Nos. 246 and 499.

† Zurla, ‘Sulle antiche Mappe’ (Ven., 1818), p. 88; D'Alberti, ‘Le construzione navali’ (Rome, 1893), p. 128.

‡ Zurla, ‘Dei viaggi i delle scoperte Africane di Aloise Cadamosto,’ pp. 21-23.

§ That these charts are not by the same author is seen from the fact that on No. 30 Cape Verde lies 1930 miglie to the south of Lisbon, on No. 31 only 1750 miglie.

|| The copies of Dr. Henry's and Cantino's charts which accompany this paper are reprinted by kind permission of the Hakluyt Society.

LIST OF PLACE-NAMES.

The figures within brackets refer to the authorities, viz. (1) Soligo; (2) Henricus Martellus; (3) Behaim; (4) Juan de la Cosa; (5) Dr Hamy's chart; (6) Cantino's Chart; (7) Canerio; (8) Duarte Pacheco's 'Esmeraldo.'

The dates are those of the Saints mentioned.

Rio (Angra) de S. Maria da Nazareth (1-8). The Ogowe, which still enters Nazareth bay, 0° 40' S.

Cabo de Lopo Gonçalves (1-8). Cape Lopez, 0° 37' S.

Rio de S. Mathias (2, 3), February 24. Now the Mexias or Animba river, 0° 55' S.

Praia do Judeo (3). The bay to the north of the Fernão Vaz river, 1° 15' S.

Rio de S. André (3), November 30, is probably the same as the Rio das barreiras (8), subsequently known as Fernão Vaz, 1° 23' S.

Rio de Campo (1), the river Kama, 1° 47' S. It may have been named after Antonio do Campo, who accompanied Vasco da Gama on his second voyage.

Cabo de S. Catharina, November 25, where stood the "tree" of Fernão Gomez (1-8). Still known by its original name, 1° 50' S.

Cabo de Pero Dias (7). Corrupted into Pedras point, 2° 41' S.

Serras do Espirito Santo (3, 4, 6, 7). Still known by that name, 2° 50' S.

Praia do Imperador, Emperor's shores (2, 3). Either off the Sette, 2° 24' S., or off the Nyango, 3° S.

Ponta das barreiras, Cliff point (4), *Serra da Praia* (6), or *Cabo primeiro* (7). Cape Mayumbe, a red bluff, in lat. 3° 13' S.

Golfo de Alvaro Martins (4, 6). Now Mayumbe bay, 3° 20' S. It may be identical with Behaim's *Angra de S. Martha*, July 27.

Serra de barreiras (4). The white cliffs, backed by three ranges of hills (part of the *Serra comprida* or "Long Range" of old charts) to the south of Mabuti point, 3° 23' S.

Os dous Montes, the Two Mountains (1, 7), or *Ponta dos Montes* (6), the two "Paps" of Banda point, or Cabo segundo, 3° 53' S.

Barrocas das faveas, Bean-field ravines (6). The white cliffs to the south of Banda point.

Golfo do Judeu, Jews bay (2, 5). Castilho, guided by Pimental, identifies it with Kilongo bay, 4° 12' S., and this I accept, although the *G. do Judeu* of Behaim's globe seems to represent Loango bay, whilst his *Golfo de S. Nicolão*, December 6, occupies the place of Kilongo. The Jew, later on, was converted into an Indian, and hence already on Reinell's chart (c. 1520), the bay between the *Cabo segundo* and the *Duas moutas* at the Kuilu, is called *Golfo do Indio*. The Repertorio dos tempos (1521), however, has an *Angra da Judia* two degrees to the north of the Congo, and Reinell's position only suits Kilongo bay. Later authorities distinguish between a *Golfo do Judeu* and a *G. do Indio*, identifying the latter with Loango bay. This I believe to be a duplication due to corrupt spelling.

Serra corasa (corada, "red, coloured") de Corte Real (3), seems to refer to Mount Salombo and the red cliffs near it, 4° 20' S.

As duas moutas, the "two corpses" of Reinell, are identical with two wooded eminences known as the Paps of Kuilu, 4° 28' S.

Praia and Serra formosa de S. Domingos, August 4, of Soligo stands clearly for Loango bay, 4° 38' S. The "*Praia formosa*" and "*terra de S. Domingos*" of Cantino's chart, the *Ponta formosa* of Behaim, the "*praia formosa*" of Dr. Hamy's chart, and the *Praia de S. Domingos* of Canerio's, all refer to the same locality.

Cabo dos baixos, Cape of the Shoals (7). Beach point, 4° 50' S.

Ponta branca, White point (1). Perhaps Massabe point, 5° 2' S.

Golfo de S. Martinho (2, 3), November 11. Kakongo and Landana bay, 5° 10' S.

Ponta formosa (3). A conspicuous bluff on Landana bay, 5° 13' S.

Ponta da barreira vermelha, Red Cliff point (1, 4). A red clay cliff on Malemba bay, 5° 20' S. The "Red cliffs" extend south to Cascaes point, 5° 23' S.

Golfo das Almadias, Boat bay (3, 4, 6, 7). Undoubtedly Kabenda bay.

Ponta dos Almadias (4). Kabenda point, which subsequently became known as *Ponta do Palmar*, 5° 33'.

Cabo do Palmar, Palm-grove cape (4, 6, 7). Red point, 5° 44' S., where there is a palm grove, to judge from the charts.

Ponta do Paul, Swamp point (1). At the mouth of the Congo.

Rio poderoso, Powerful river (2, 3), *Rio do Padrão*, River of the Pillar (3, 4, 8), *Rio de Mani congo* (6, 7), *Emzaze* (8), is our river Congo.

Cabo or *Ponta do Padrão* (1, 2) and *Padrão primeiro* (7). The cape where Cão set up his first pillar, that is, Shark point at the Congo mouth, 5° 4' S.

Cabo redondo, "Round cape" (6), corrupted on Behaim's globe into *muoruodo*, i.e. Margate head, 6° 31' S.

Serra formosa (6). The hills south of preceding.

Cabo redondo (1, 2). A cape near Funda bay, 6° 55' S.

Ponta delgada (6). Lojespoint, low and sandy, 7° 48' S.

Rio de Magdalena (1, 3, 4), July 22. The Loge river, 7° 58' S.

Rio de Fernão Vaz (1, 3, 4). The river Dande, 8° 28' S.

Rio Mondego (6). The river Bengo, 8° 42' S.

Angra Grande (1), or *Golfo do Mestre* (6). Bengo bay.

Punta de Miguel (3), September 29, or *da Espichel* (4). The Morro das Lagostas, 8° 45' S.

Ilhas das Cabras, Goat islands (3, 4, 6, 8). The islands opposite Loanda city, standing upon a tableland (the *Monte alto* of Behaim; the *Tablado* of Juan de la Cosa).

Punta das Ilhas das Cabras (6). Palmarinhas point.

The river Kwanzo is not to be found on early charts. P. Reinel (c. 1520) already knew the native name, and called it *Coamsa*.

Cabo ledo, Joyful cape (4), still retains its ancient name. It is a rugged black promontory resembling a lion when seen from north-north-east, 9° 49' S.

Punta das Camboas, Fish-garth point (6). Now Cabo de S. Braz, 10° S.

Terra das duas Pontas (1) is the Morro of old Benguela, which appears from some bearings as a double point, 10° 45' S.

Cabo do Pichel, Tankard cape (6), and *Punta de S. Lourenço*, August 10 (4, 7, 8), appear to be identical with the preceding.

Rio de S. Lazaro, December 17 (6). The river Cuvo, 10° 50' S.

Rio do Paul, Swamp river (1). River Catumbela, 12° 26' S.

Angra or *Golfo de S. Maria* (1, 2, 6). Benguela bay, 12° 30' S.

Cabo de S. Maria (5). Ponta de S. Joze.

Castel d'Alter poderoso (1), *C. de S. Agostinho* (2), *Castel poderoso de S. Agostinho* (3), *Cabo do Castello pedroso* (7). There is a village, Alter pedroso (Stony Alter), near Portugalete (see note, p. 631). The "poderoso" (powerful) of Soligo is evidently clerical error. The full name would be *Castello d'Alter pedroso de S. Agostinho*, a reference to the pillar set up to the south. I identify this "Castle" with the granite cliffs to the south of Ponta choca, 13° 17' S.

Cabo do lobo or *dos lobos*, Seal cape (1, 5, 6), upon which Cão erected the pillar dedicated to S. Augustin (August 28); also known as *Ponta Negra* or *Ponta Preta* (8). Now Cape St. Mary, 13° 26' S.

Ilha do lobo (4). One of the islets near the preceding.

Monte negro (5), or *Cabo negro* (7). The mountains rising above Cabo do Lobo.

Angra de João de Lisboa (6). The Lucira grande bay, remarkable for its intensely green water, 13° 51' S.

Golfo da Praia (4). Perhaps the Bahia das matilhas, with its red cliffs, 14° S.

Monte Negro (6). The dark-coloured Morro do velho, or Old Man peak, with islets to the south of it, 14° 23' S.

Terra fragosa, Rugged land (2, 3), and *Terra parda*, Dark land (6), are descriptive terms applied to the country between the Morro do Velho and the Golfo das Aldeas.

Cabo do Leão, Lion cape (3), *Rio certo*? (3), *Cabo Zorto* (2), and *Cabo verde* should be along this part of the coast.

Monte negro, Black mountain (2, 3, 5, 7, 8), upon which Cão set up his third pillar, is now known as *Cabo negro*, and bounds Port Alexander in the north, $15^{\circ} 40' S$.

Golfo or Angra das Aldeas, Bay of the Villages (6, 7, 8), which I believe to be identical with the *Golfo do Salto* (4). Here are—

Castello primeiro (7), the wall-like cliffs south of the Coroca river;

Punta de areia, Sandy point (6), now Bateman point; and

Punta dos baixos, Shoal point (4), the point opposite the Dormer bank.

Punto do Moço, Young Man's point (4). Now Albina point.

Golfo da balea, Whale bay (2, 5), or *Golfo das areias*, Sandy bay (6, 7). The Great Fish bay.

Manga das areias, Sandy sleeve (8). Tiger peninsula, in 1778 still an island.

Ponta das pedras, Stony point (8), and *Montanha da pedra*, Stony hill (6). The Monte Vermelho near south extremity of Great Fish bay, $16^{\circ} 50' S$.

Praia verde, Green beach (2, 7). The mouth of the Cunene, $17^{\circ} 15' S$.

Cabo preto (4) or *Cabo negro* (6, 8). Now Cabo frio, $18^{\circ} 23' S$.

Serra de S. Lazaro, December 12.

Punta da Pedra, Rock point (7). Fort Rock point, a white block of granite.

Punta delgada, Point Slender (4). Rock spit, a sandy tongue.

Praia de Bragança (5). A João de Bragança was Moço do monte (chief forester) in 1494.

Angra de Ruy Pires (8). Off Uniab river, $19^{\circ} 50' S$.

Punta de Ruy Pires (6). Palgrave point, $20^{\circ} 31' S$.

Angra pequena de S. Amaro (8), September 2. Ogden harbour, described by Captain Morrell in 1832, but now non-existent, $20^{\circ} 57' S$.

As areias, the Sands (8). Applied to sandhills along coast.

Praia das neves. Snow beach, of later maps, supposed to have been given to the sandhills because of their whiteness, but evidently a misprint for *Praia das nevoas*, the Shore of Mist, as Homem has it, a very appropriate designation.

Golfo da Baleia, Whale bay (2, 4, 6). Cape Cross bay.

Cabo do Padrão (2, 4, 5, 6). Where Cão set up his last pillar; now Cape Cross, $21^{\circ} 50' S$.

Praia das Sardinhas, Sardine shore (2). Sierra bay.

Serra parda (2, 3, 4). The Cabo dos Farilhões, dark and rocky, in the midst of sandy dunes, $22^{\circ} 9' S$.

Terra de S. Barbara (6), December 4. The country to the south of Cape Cross.

Praia das Pedras, Stony beach (7, 8). Now Rock bay, $22^{\circ} 18' S$.

Praia das alagoas (6), or *Praia verde* (7). Lagoon or verdant shore at the mouth of the Swakop, $22^{\circ} 42' S$, marked by dense green foliage. Three small lagoons are just within the bar.

Praia das aves (6). A very appropriate name for a coast abounding in bird-life.

S. Ambrosio (7), April 4. Perhaps intended for the Swakop.

Golfo de S. Maria da Conceição (6, 8), or *Angra da temeridade* (7), is our Walvisch bay.

Cabo do Espirito santo (2). Now Pelican point, in $22^{\circ} 54' S$.

Golfo da Baleia, Whale bay (2, 8), or *Porto do Ilhéu* (7). Sandwich bay, $23^{\circ} 21' S$.

The island which formerly sheltered this bay may have grown, in course of time, into a spit of sand, an evolution not at all rare along the west coast of South Africa.

Praia das alagoas (7) may refer to the lagoon at the head of Sandwich bay, or to the mouth of the Kuiseb, which enters Walvisch bay.

Areias gordas (5), "Hell." An appropriate name for the sandy waste to the south.

Rostro da Pedra, the "Rocky beak" (4, 9), I believe to be Hallam's Bird island, in $24^{\circ} 37' S$. The terra da Roca (6) faces it, and is also called *terra das baizas* (8), from the shoals close by.

Golfo de S. Thomé (6, 7), December 21. The bay or indentation to the north of Mount Sylvia, $25^{\circ} 5' S$.

Calheta dos tres Irmãos, "Three Brothers creek" (6, 7), are the three Easter cliffs, separated by small indentations, $25^{\circ} 25' S$.

Enseada pequena, Little bay (8), seems to be known also as *Golfo de S. Antonio* (7), and

there is little doubt, to judge from the description given by (8), that it is identical with Spencer bay and Mercury island, 25° 43' S.

Golfo de S. Maria da Victoria (4, 5, 6) is evidently named in honour of the famous victory of Aljubarrota, on August 14, 1383. As placed on Cantino's chart, I should identify it with Hottentot bay, 26° 8' S., but on Juan de la Cosa's and Dr. Hamy's charts it is associated with the *Angra* or *Golfo das Voltas*.

Ponta dos Ilhéos (6, 7, 8). An appropriate designation for the cape facing Ichabo I., in 26° 17' S. Here also might be found the *Angra dos Ilhéos* of De Barros. On Diogo Homem's chart (1558), a pillar stands to the north of this point.

Golfo de S. Christovão (6), July 25, we believe to be the bay absurdly called *Angra pequena* on our modern maps, notwithstanding that it is the only large bay along the whole coast from Great Fish bay to St. Helena bay. It is identical with the *golfo* or *Angra das Voltas* of (4, 5, 7 and 8) (see note *, p. 645).

Punta da Angra (6), is *Angra* point of modern maps.

Cabo da Volta and *serra parda* (2), where stood the padrao of Santiago, is now known as Diaz point, 26° 38' S.

Ilhéos dos baixos (4, 6). Halifax and other islets to the south of Diaz point.

Golfo de S. Estevão (5, 7), December 26. Elizabeth bay, 26° 52' S.

Ilhéos seccos (4, 7). Possession and other islands further south. The *Ilhéu do pantano*, "Swamp island," of Germanus should be one of these.

Terra de S. Silvestre (6), December 31.

Volta das angras (2), fairly suits the modern Cape Volta in 28° 42' S. Its latitude nearly agrees with that assigned by De Barros to his *Angra das voltas* (viz. 29° S).

Terra dos bramidos (4, 6). The coast to the south of Orange river, where the heavy swell causes a continuous roar (*bramido*).

Serra or Lombada da Penha, ridge or summit of the rock (6, 8). Vogel Klip, 29° 40' S., 4300 feet. For "*Serra de perétal*" (7) we ought probably to read *Serra do penedo*, which means the same.

Morro de pedra (4, 8). Roodewall, a red cliff, 30° S.

Rio do Infante. Apparently named after João de Infante. The earliest record of the name I find in the *Repertorio dos Tempos* of 1521. It is the Olifant river, 31° 42' S.

Serra dos Reis (47), January 6. Olifant Bergen, 32° 10' S.

Angra de S. Helena (6, 7, 8). The bay discovered by Vasco da Gama.

Porto de S. Lucia (5). Now Saldanha bay.

Ilha branca, White island (5). Now Dassen island.

Punta da Praia (8), Green point, Table bay.

Picq fragoso (3). Now Table mountain.

Cabo de boa Esperança, Cape of Good Hope, 34° 22' S. Supposed to have originally been named Cabo d'El-Rei (see p. 648).

Golfo dentro das serras, Gulf within the Mountain Ranges (2). Now False bay.

Ponta de S. Brandão (8, 8), May 16. Our modern Cape Agulhas, 34° 49' S.

Gulfo das Agulhas (6). A bay to the east of the preceding, now Struis bay. See also note, p. 647.

Cabo do Infante (5, 6, 7, 8). Still known in a corrupted form as Cape Infanta, 34° 28' S.

Rio da Nazareth (4, 5). Now Breede river.

Rio dos vaqueiros, River of Cowherds (2, 5). It is called Rio della vacche by Martellus Germanus, and corresponds to our Gouritz river, 34° 20' S.

Cabo das vaccas (8), or *Cabo delgado* (4). Now Cape Vacca.

Angra das vaccas, Cow bay (4). Now Flesh bay, 34° 12' S.

Ponta da estrella, Star point (4). Now Cape St. Blaize, 34° 10' S.

Terra de S. João (7), June 24 or December 27. The country to the west of Mossel bay.

Golfo dos Vaqueiros, Gulf of the Cowherds (4), *Bahia da aguada*, Bay of the Watering-place (5), or *Golfo (Angra) de S. Braz* (6, 7, 8). Now Mossel bay.

Serra de S. Lazaro (5), December 17. Western Outeniqua mountains, rising 5000 feet.

Ponta da Pescaria, or Fishery point (7). Gericke point.

- Lago cerrada*, Enclosed lake (6, 7). Zwarte vlei.
Serra da Estrella, or Star mountains (5, 6). Now Outeniqua mountains.
Cabo talhado, Steep cape (2, 5, 6, 7). Cape Seal, 34° 6' S.
Bahia or *Angra das lagoas*, that is, Bay of the Lagoons (6, 7, 8). Now Plettenburg bay. The old name does not seem to be very appropriate.
Terra das trovoadas, Land of Thunderstorms (7). The Langekloof.
Ponta de Ruy Pires (5). Seal corner point, 34° 2' S.
Ponta (golfo) das queimadas, Forest fire point (5, 6, 7). Now Cape St. Francis and Krom bay.
Golfo dos Vaqueiros, Cowherd bay (2, 5). St. Francis bay.
Cabo do Recife, Reef cape (5, 6, 7, 8). Still Cape Recife, 35° S.
Golfo da Roca, Rock bay (5, 6, 7). Now Algoa bay.
Ilhéos da Cruz, Cross islets (6, 7, 8). St. Croix, 33° 48' S.
Ilheos chãos, Low islands (6, 7, 8). Bird islands, 33° 50' S.
Ponta do Carrascal, Green Oak point (6, 7). Now Woody cape.
Padrão de S. Gregorio, St. Gregory's pillar (2, 5, 6), March 12. Now cape Padrone, 33° 45' S. The "S. Georgo" of (2) is a clerical error.
Rio da lagoa, Lagoon river (5, 6). Now the Kasuga river.
Penedo das Fontes, Fountain rock (4, 6). Now Ship rock, to the west of Port Alfred, 33° 38' S. Pacheco uses Penedo das Fontes as a synonym for the Ilheo da Cruz.
Ilha do Infante (2, 4). Now Three Sisters, off Riet point (?).
Rio do Infante (6, 7, 8). The Great Fish river, 33° 30' S., 27° 8' E.

THE OASES OF THE MUDIRIEH OF ASSYUT.*

By A. R. GUEST.

THE oases of Dakhilah and Kharjah lie at the foot of the high sterile plateau of the Libyan desert, which here ends in a steep wall of cliffs, known to the natives as El Muhaita, or Muhita, "the enclosure." On the south and south-west the ascent of the land to the desert level is much more gradual. There is in this direction a vast amount of sand, and the hills are smaller and scattered. The two oases are separated by a considerable stretch of desert, the passage of which, with the means available, occupies two days, and there is scarcely any intercourse between their inhabitants. The oases owe their fertility to the presence of underground water, which, being under pressure, comes to the surface when borings are made. Most of their artesian wells, known locally as "ains," are ancient, the art of making them having apparently been lost for a long period, and only resumed in this century. The floor of the oases is generally undulating, and as a rule the soil is fertile wherever water can be found. Neither the small strips of cultivation round the "ains," nor the palm-groves, which indicate the position of the rare villages, are, however, prominent features in the landscape. Sand-dunes, lying north and south in the direction of the prevailing winds, occupy extensive areas. Many are quite bare, and, progressing under the action of the wind, are most destructive.

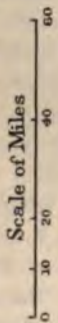
* Abbreviated from a report printed by order of the Ministry of the Interior, Cairo 1900. The illustrations are from photographs by Dr. B. Moritz.

THE OASES OF ASSYRIA

Scale of Miles
0 10 20 40 60

Routes
D - Darb - road

Map details:
 - Rivers: TIGRIS (R. Tigris), EUPHRATES (R. Euphrates)
 - Oases: D. ZAWIYA, D. GHAZAL, D. KHATIB
 - Locations: ASSUT, Abu Tij, Timao, Ghanaim, Mashiyah, Takta, Maragah, Nizel Kadi, Juhaimish, Sohag, Kawagmil, Girdah, Bar David, Arabat el Medfouneh, Samhud, Kus, Luxor, Esneh, Bahari
 - Mountains: Jebel el Muhitah, Jebel el Amur, Jebel el Khatib
 - Other: D. FARAFRAH, D. EL GUBARI



Routes

D - Darb - road



ER RAMLAH EL KABIR, ON THE ASSYUT ROAD TO KHARJAH.

The oases produce grain and other necessities, but not in sufficient quantity for the support of the inhabitants, who make up the deficiency by the sale of their dates. These form their principal means of livelihood, and practically the only article of export. There are many evidences that both the population and cultivated area were once larger than at present.

The inhabitants do not appear to differ from the fellahin of Upper Egypt, but in Kharjah there is a trace of Sudanese blood, due to the former yearly passage of caravans from Darfur. The only language spoken is Arabic, the dialect in use differing somewhat from those of neighbouring districts. It is said that it employs many classical words, and a careful study of the oases dialect might throw some light on their history. The people are Moslems to a man, belonging almost entirely to the Shafii and Maliki sects. In Dakhilah, the Senussis have been established some thirty years, and as they educate the children their influence must be considerable.

The roads through the desert to the oases are broad, well-beaten tracks worn into furrows by long usage. The desert is generally hard and rocky, consisting of plain after plain separated by slight rises and hollows. In some places the road winds between rocks, or passes through heavy sand, and in these it is difficult to find the way without a guide. There is generally good going for a camel, but broken ground in each road would render it almost impassable for any kind of vehicle.

The principal traffic passes along during the date season, which begins in August and is practically over in January. During this period fellahin go in parties of ten or twenty from most of the adjacent "balads" (villages) in the Nile valley, to buy dates, which are exported principally from Kharjah. These fellahin are technically called "saffarah," while the merchants visiting the oases are called "Tujjar." Arabs from the west of the Nile valley go in small numbers to the oases as guides, hirers of camels, or traders, but there is no general migration of the Arab tribes to the oases at any season. These Arabs have few camels, and are in process of settling down to the condition of fellahin, the Bahi tribe being the one which retains its nomad habits the most. It is the one which chiefly frequents Kharjah, while the Amaim go to both oases. About twenty years ago the guarding of the roads was entrusted to the various tribes, who then levied toll on each camel that passed along them. This arrangement has been abolished, but the tribes have not yet relinquished an idea of possession, and when a brigandage occurs on any road, the tribe to which its guardianship used to belong may be suspected. In addition to the Arab tribes of the adjacent provinces, the Rabayi, whose settlement is at Kardasah, in Gizeh, come down annually to Dakhilah *viâ* Farafrah. They arrive in August, bringing large numbers of camels, and returning by the Darb et Tawil to Assyut, and thence by the Nile valley to Gizeh.

A few words may now be devoted to the more special characteristics



OASIS OF KHARJAH.



TOWN OF MUT, OASIS OF DAKHILAH.

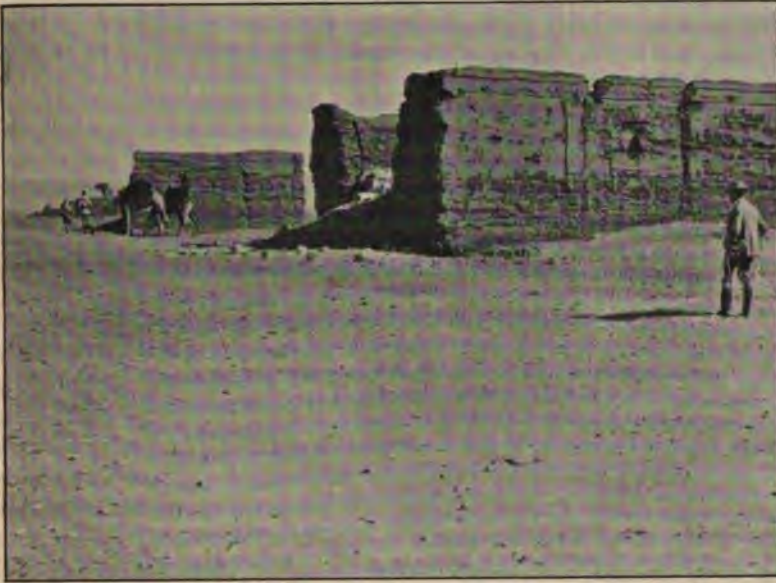
of the two oases. Kharjah is but sparsely populated, its most striking feature being the amount of sand which chokes the valley, and which gives the impression that the oasis has been overwhelmed with sand. Ruins exist at a great distance from the present cultivation. Little boring has here been done, and the water-level has not sunk as in Dakhilah. Kharjah was known to the ancient Egyptians as "Khenem" and "Uah Ris," the southern oasis. The first name is still preserved in Ghanimah and Umm el Ghanaim, two mountains to the east of the oasis. The inhabitants still call it "Wah men Amum," obviously an ancient Egyptian name, but amongst the Arabs the common name is El Wah el Kharjah, or El Kibliyah. The principal town, itself called Kharjah, is about 130 miles from both Assyut and Esneh, but only 104 from Girgeh. From the latter it is reached by four days' marching, and from Assyut in five. Besides the date, the produce is grain and fruit, and a few vegetables. The commonest trees are the "sant" and the dom palm, the sycamore, once plentiful, being hardly known now. The "sant" are remarkably fine. Good pasture for camels is found in places, but none of these are owned by the inhabitants, goats being the most plentiful domestic animal. It is stated that some six or seven hundred camels come to Kharjah during the date season, of which about one hundred go on to Dakhilah, about a hundred also coming to Baris and returning to Esneh. These figures seem, however, considerably underestimated. In the time of the "Jallabah" or slave traders from Darfur, perhaps four thousand camels a year, belonging to Sudanese

merchants, passed Kharjah in January and February on their way to Assyut. The inhabitants are now very poor, and Baris, twenty-four hours south of Kharjah, has suffered especially since the cessation of the Sudan trade.

Dakhilah, though smaller, is more fertile and productive than Kharjah. The eastern half is very free from sand, though west of the dunes are frequent. The towns of Kasr, Mut, and Smint are in the neighbourhood of very extensive ruins, which evidently mark the original sites, now covered with sand. The oasis is known to the Arabs as El Wah ed Dakhilat, or El Gharbiyat. Kasr Dakhil is still its principal town, though the local government has been removed to Matruh. The former is prosperous, and well supplied with water, though, as elsewhere in this oasis, the water-level has fallen. Many wells have been sunk by modern boring-machines. Kasr is the manufacturing centre of the oasis, the principal industries being pottery-making, weaving, basket-making, and the pressure of oil. The pottery is well worth attention, some of the vessels being exactly the same as those to be seen in fragments on the old sites. Balat, in the east of the oasis, is 170 miles from Bani Adi, in the Nile valley, while the distance from Kasr to Farafrab is about 115 miles, and from Tanidah to Kharjah 70. The only direct road to the Nile valley is that to Bani Adi. The productions of Dakhilah are similar to those of Kharjah, the dates fetching, however, a slightly higher price. The dom palm is very rare, though



GENERAL VIEW OF KASR DAKHIL, OASIS OF DAKHILAH.



RUINED TEMPLE, SMINT EL KHARAB.

not, as stated by Rohlfs, entirely absent. The number of camels which visit the oasis in the date season is estimated at two thousand.

The history of Kharjah and Dakhilah can be traced from very early times by the aid of the ancient inscriptions and documents, and the writings of Herodotus, Strabo, Plato, Ptolemy, Ulpian, Procopius, and the Arab geographers. Three of the latter, El Makrisi, El Istakhri, and Ibn Haukal, seem to have thought that the oases were actually abandoned at their epoch, but this would seem to be an error. What is probably true is that they had lost much of their importance by the closing of the desert roads to the west, which appear to have led to Ghanat, Fezzan, and even Marocco. According to El Masudi, Marwan, the last Umayyad Khalif of Damascus, was slain at Abu Sir, near Mallawi, as he was preparing to proceed west to Marocco across the desert. The oldest official paper in the possession of the inhabitants which I have seen is dated 1180 A.H. A tradition quoted by Rohlfs, to the effect that the western roads were made impassable by a force of Mamluks, who stopped the wells in order to repel the raids made from that direction, appears to be demonstrably without foundation. From all we know of their history, we may deduce that the oases have never been places of great importance. That they were in a higher state of cultivation in the ancient Egyptian times than at present is unquestionable, and there is evidence that they were flourishing in the early days of the Roman emperors. It seems likely that

they shared in the decline of Egypt under the later Roman rule, being subject to raids from the south after the withdrawal of their garrison, while the closing of the roads to the west must have been a serious blow to their importance.

THE DANISH EAST GREENLAND EXPEDITION IN 1900.

By Lieut. G. C. AMDRUP, R.D.N.

TILL 1898 no one had set foot upon the east coast of Greenland from about $65\frac{3}{4}^{\circ}$ lat. to about $70\frac{1}{4}^{\circ}$ lat. except some Eskimo, who, it was ascertained by the expedition of G. Colin in 1883-85, had formerly lived on the coast to about $67\frac{3}{4}^{\circ}$ lat. Several expeditions had tried to pass the ice-river which blocks the coast, but had not succeeded; one of them on board the French brig *Lilloise*, commanded by Lieut. Blosseville, disappeared, with all hands on board, in 1833. The coast from $68\frac{1}{2}^{\circ}$ to 69° N. had been mapped from on board ship, but at a rather



SKETCH OF THE COURSE OF THE "ANTARCTIC" AND OF THE COAST-EXPEDITION IN 1900.

long distance outside the ice-barrier. The coast from $70\frac{1}{4}^{\circ}$ to 69° was mapped by Scoresby in 1822, and by Ryder in 1892, but in both cases from on board ship. But many miles of coast on the chart were only still shown as a dotted line.

On my first expedition, undertaken during August 16, 1898, to September 12, 1899, the coast from $65\frac{3}{4}^{\circ}$ to $67^{\circ} 22'$ was explored and mapped. The explorations were made with sledges in winter-time, and in summer-time in a light-built wooden boat, 21 feet long, manned with two naturalists and two sailors, beside myself. Two dépôts with provisions were erected, one at $66^{\circ} 7'$, and the other at $67^{\circ} 15'$, and fine scientific collections were brought home.

My last expedition, which returned to Copenhagen on October 4, 1900, has from every point of view been a great success. For this expedition was bought the Swedish vessel *Antarctic*, used in the expedition of Dr. A. G. Nathorst in 1899. Besides the crew, the expedition numbered five naturalists, one army officer for mapping, one artist, and three sailors, who would accompany us on the boat expedition along the coast. The expedition left Copenhagen on June 14, and arrived at Jan Mayen on June 25, staying there till the 28th, making scientific researches and collections. The edge of the ice-pack was met with on the north-west of Jan Mayen on the evening of the 28th, and was followed north-east and north until July 6 at four o'clock in the morning, when the ice (at $74^{\circ} 30'$ lat., $30^{\circ} 58'$ long. W.) allowed us to make way towards the west. Inside the dense band of pack of smaller



CAPE GARDE, ON BLOSSONVILLE COAST.



CAPE CHRISTIANSEN, 67° 13' N. LAT.

floe-ice now came large ice-fields, often many miles in extent, with channels between them. On July 10 we got the first glimpse of coast, and on the 11th, at two o'clock in the morning, we anchored Griper Road, on Sabine island. We examined Sabine island, and for a fine collection of fossils. The depôt for Sverdrup erected by Nathorst in 1899 was found in good condition. In a cairn next to depôt I left a record, informing Sverdrup that the *Antarctic* would be on the coast till September 1. Then we landed at Cape Borlase Ward and steered south along the coast to Cape Dalton (69° 30' lat.), where we arrived July 18. South of Cape Dalton the ice was so dense that it was impossible to enter it. With three companions I left the ship here, giving the leadership of the ship-expedition to Dr. N. Hartz, and the command of the ship to the first mate.

At Cape Dalton we built a small wooden house, where all our provisions, sledges, kayaks, etc., were stored. On July 22 we left Cape Dalton, bound for Tasiusak, 65° 35', in a light wooden boat 18 feet long and 5 feet broad, with provisions for two months and a half and a good supply of ammunition, in case we should be obliged to winter on the coast. All the outfit was as light as possible, in order that we might be able to haul the boat over the ice without difficulty. All the provisions were stowed in boxes, in such a manner that they could not shift if the boat should be crushed in the ice. But we were always in luck, and on September 2 we arrived at Tasiusak, having done about 500 miles in the boat. My task was done; but, in addition, I a

travelled along the coast for almost half a year, partly in an ice-boat, and partly with sledges, and had many exciting accidents and narrow escapes, the coast being, I dare say, one of the most inhospitable in the world, with its steep cliffs and numerous large glaciers, and with the polar ice driving with the current along the coast.

The ship expedition, under the leadership of Dr. N. Hartz, left Cape Dalton on July 22, and examined and mapped the coast to Scoresby sound. From July 1 to July 20, the expedition carried out scientific researches in Hurry inlet and Scoresby sound. Then the expedition left the sound, landed at Cape Grey, on the Liverpool coast, on July 23, and mapped and examined the bays west of Cape Gladstone. The expedition then made a short run in Davy sound and King Oscar's bay, and left the east coast of Greenland on September 1. After a short stay at Dyrefjord, in Iceland, the ship arrived at Tasiusak on September 11, when I took the leadership of the expedition and the command of the ship. We left Tasiusak on September 18, and arrived at Copenhagen on October 4.

Besides the mapping * of the coasts and bays, the expedition brought home fine palæontological, geological, zoological, and botanical collections; also a living specimen of the musk ox, and ten living specimens of the lemming (*Myodes torquatus*). Four ermines were killed and brought



VIEW FROM THE NORTH SIDE OF KAUGERDLUGSUAK.

* The new chart of the unknown coast and of the bays west of Cape Gladstone is still unfinished, and is for this reason not shown in the sketch-map.



A SMALL GLACIER EAST OF KAUGERDLUGSUAK.

home. An interesting ethnographical collection was made in the huts and graves of the Eskimo. Especially interesting is a collection found at $68^{\circ} 10'$ lat., and sixteen skulls from old graves were obtained. No Eskimo lived on the unknown coast from Scoresby sound to 65° of Angmagssalik. No traces of Andrée or of Blosseville were seen. Hydrographical researches were made occasionally. Astronomical and magnetical determinations were made at many different localities on the coast.

ON THE AFGHAN FRONTIER: A RECONNAISSANCE IN SHUGNAN.*

(NOTES FROM A RUSSIAN OFFICER'S JOURNAL.)

THESE notes are derived from the journal of a Russian officer, Lieut.-Colonel Serebrennikov, who was a member of one of two reconnoitring parties, despatched by the Russian Government into the little-known country of Shugnan from Pamirsky Post during the year 1894.

The first party, of which Mr. Serebrennikov was a member, penetrated through the valley of the Shakh-Dara, whilst the second confined itself to the valley of the Gund river. Both parties ultimately united in the valley of the Kharokh river near fort Kala-i-Bar-Panja, the capital of the Khanate of Shugnan.

This region is almost virgin ground for the explorer, most of the particulars we have of it at present being derived from hearsay. In view of this fact, and a

* Communicated by Dr. A. Markoff.

of the great probability that this hitherto neglected region may ultimately develop, by the march of political events, into a place of strategical importance, as the narrow belt of land separating two great powers—Russia and England—in Asia, it is to be hoped that the following short descriptive notes may induce some enterprising Englishman to undertake the task of exploration in a thorough and scientific spirit. This is the only excuse for offering these notes here. A military officer, whether English or Russian, on such a reconnoitring expedition has scarcely the means, if he had the will, to effect an exploration in the proper geographical meaning of the term. To get a written account at all, however sparse in detail it may be, from an eye-witness is a step in the right direction.

The first writer to mention Shugnan is the Chinese Buddhist monk Hwen-Thsang (in the seventh century); but every description, commencing with that of the Chinese traveller and ending with those of the English travellers Wood (1836), Forsyth, Trotter (1873) (in the nineteenth century), is largely made up from hearsay accounts. The first European who actually visited Shugnan *in propria persona* was the Russian Dr. Regel (1882-3). He was followed, a little later in 1883, by the mining engineer Ivanov. Neither traveller has published anything important on the country. In 1894, Lieut.-Colonel A. Serebrennikov, in the reconnoitring expedition to which reference has been made above, succeeded in riding along the entire courses of the rivers Shakh-Dara, Gund and Kharokh, and also along a portion of the Panj.*

As to the result of his travels we may now let him speak for himself.

A. M.

Pamirsky Post, Sunday, July 9, 1892.—There is a break in the monotonous run of garrison life at last! General Yonov has arrived with his staff, and after feastings, congratulations, etc., we settle down in earnest to discuss our proposed reconnaissance into Shugnan. There is no time to be lost, as we learn that the Afghans are expected almost daily to cross the river, and we must forestall them.

July 19.—Our two parties, each consisting of three officers, twelve infantry, twenty cossacks, and some guides, set out at eight o'clock this morning in a drizzling mist. We forded the river Murgh-ab after parting from and receiving the good wishes of all our brother-officers remaining behind, and also—last but not least—those of the only lady on the Pamirs, Madame S. G. Skerskaya, who had, in spite of the weather, made one of our honorary escort up to this point. The river is rather high at this season, and the waters rose to our horses' saddle-cloths even at the ford, but in autumn and winter, when its affluents are not fed by the melting of the glaciers, fording at any point is very easy.

How exceedingly monotonous and dreary the scenery on this vast Pamir plateau is! The low mountains, with vague outlines, which bound the broad river valleys, are quite bare and lifeless. In this respect how different from the awesome mightiness of some of the giants in the Alai range! But the fact which should astonish us is the tremendous height above sea-level, at which we are standing in these valleys. This, of course, cannot be seen, but only felt—fever, violent headaches, nose-bleeding, etc., are frequent symptoms here, and tell their own tale as regards altitude. The natives call these symptoms "tutek."

After passing the burial vaults of Shadjan, on the right side of the river, we turned sharply to the left, ascending a small plateau whereon are more graves, but

* The parts of Shugnan within the valley of the Panj have lately been visited by the two Danish Expeditions under Lieut. Olufsen. On the second of these a reconnaissance east of the river was also made.

without any inscriptions. We then descended into the valley of the Kara-su river (an affluent of the Murgh-ab). In this river there is a kind of "eyot" covered with parched and sickly-looking willows, and it is strange how our eyes would affectionately cling to this anæmic oasis, which represents the sole timber growth in the Pamir highland from Fergana and the Alai to the Koi-tezek pass on the Shugnan frontier, about 240 miles.

The river now washes its way through a thick bed of conglomerate, 45 to 50 feet deep.

After crossing over to the left bank of the stream, we followed the road which brought us almost straight to the "rabat" (Persian inn) at the mouth of the river Boz-Jilga. Here we stopped for the night. More by luck than by foresight, we resisted the temptation, weary as we were, of camping in the open—for the rabat being merely a quadrangular room with a clay dome, could not, of course, accommodate us all—and erected two of our tents outside. It was fortunate we did so for a stiff shower fell during the night.

As a rule, the rainfall is very slight on the Pamir, and rainy days do not average more than 8-10 per annum.

We set out at daybreak next morning and crossed the summit of the Naiza-tash. This latter slopes so gently, that a carriage could easily traverse it. The road now courses between low mountains, with the usual depressing and spiritless "Pamir perspective, which, however, opens out when we enter the Alichur valley. Here the eye can take a wider sweep, and embraces the whole of the valley, lying there as if in the palm of one's hand, with the Chatyr-tash (the tent-stone) rising in the middle, and looking really like a huge tent in the distance. A strong wind, nearly always blowing along the Alichur valley, and in our case proved very disagreeable, as we had already marched 29 miles, and were feeling tired. We camped shortly afterwards for the night about 2 miles below the Chatyr-tash on a rather marshy plain, covered with fairly good grass. Here we consulted as to our plans for the morrow.

As it was imperative that we should reach Shugnan in time to forestall the designs of the Afghan raiders, we decided to push on 18 miles next day, as quick as possible and without halting.

Although the Alichur valley is noted for its rich grazing lands, the nomad tribes have not yet sufficiently got over their natural fear of the Afghans to make general use of them. This warlike, though treacherous race, may be justly termed the banditti of Central Asia, and, so long as they exist, will they be a constant thorn in the sides of both English and Russians. During the summer of 1891 and 1892 they established a small military post on the eastern borders of the Yashikul, near Sume-tash, whence they raided and blackmailed Russian subjects on the Pamirs. It cost the Russians a very sanguinary encounter before they could be ousted from their ill-famed stronghold.

July 21.—We started at 7.15 a.m., after leaving three cossacks (as we did also at the previous halting-places) to keep up our line of communications. We again followed the road, which from this point skirts the left bank of the Alichur river, winding up and down, in and out, at the base of the mountains. The low parts of the valley are marshy, and we had to avoid them. We crossed the stream Bash Gumbez, which falls into the Alichur further down, and passed on to the rabats of Abdullah Khan. This rabat is in very good preservation, though over three hundred years old.

A disagreeable head wind was now blowing, and we were all glad when, at four o'clock, we saw in the distance the lately-built rabat near the Mukur-Shegemb river and ravine. It stands on a high bank, and can be clearly seen a good way

off. The soil thereabouts is salt, and vegetation grows scantily only along the banks of the river.

July 22.—We set out again early next morning, after leaving our usual post of three cossacks behind. The road here turns to the left, and soon takes us away from the Alichur valley.

Our most direct route would have been along the Yashil-kul lake, thence following the Gund river, which flows out of its western side. As this road, however, is very hard to traverse, we decided to take the longer but easier route over the summit of the Koi Tezek, and thence through the valley of the Toguz Bulak river.

This we did, and camped for the night by the salt lake Tuz-kul. Here we received a deputation of a hundred Shugnanis, who petitioned us on behalf of the inhabitants of the Shakh-Dara for protection against the Afghans. They were a poor, dispirited-looking body of men, and must have stood to the Afghans as sheep to wolves. Their dress, made from the coarsest stuffs, led us to think that they were all simple peasants; but in this we were mistaken, as we soon perceived, for no less a personage than Azis-Khan, nephew of the last independent ruler of Shakh-Dara, was amongst them. This was the ruler who had been executed in Roshkala by order of the Shugnan ruler (Shah-Abduraim-Khan).

Azis-Khan, our humble petitioner, was a young fellow of about twenty or twenty-two, of medium height, with the typical features of a mountain Tajik, and the customary curly whiskers, like those we see depicted on many of the old Assyrian bas-reliefs. His dress, consisting of a black cotton "khalat," or gown, was mean in the extreme, and neither in bearing nor in apparel did he betray any hint of his princely birth. The "caste" system does not exist in Shugnan, and, owing to the general poverty which prevails throughout the kingdom, there is no visible distinction, generally speaking, between prince and pauper. Of course, there are exceptions. Later on, I met another Shugnan prince, Timur-Shah, nephew of the last Shugnan Khan, Soid-Akhbar-Shah, whose dignified bearing and manners were quite in keeping with his birth. I suppose, though, it must be hard to be dignified on next-to-nothing a year, and an empty belly will certainly humble prince as well as pauper in the long run.

We took advantage of the visit to learn something about the country, state of the roads, etc., and heard pleasant news. In the first place, it appeared, according to Azis-Khan, that the roads up to Shakh-Dara would be found exceedingly good; and, in the second place, that the inhabitants of the latter were waiting our advent with impatience, being in mortal terror of the Afghans. We continued on our way, therefore, in the best of spirits.

On entering the Shakh-Dara territory we soon had practical demonstration that, so far as our welcome was concerned, things were as Azis-Khan had represented them. We were quickly surrounded by smiling helpers, all eager to do something for us—some collecting fuel, others helping to carry the heavy loads, etc. As regards the state of the roads, however, we were disappointed, for though they may have been "exceedingly good" according to the Shugnan standard, to us they seemed exceedingly bad, even in comparison with Pamir roads.

We halted for the night near the Mazar-Kyrk-Sheit, and several of our party, having an hour or so's daylight, took advantage of it to go fishing in the stream emptying itself into the Bulyun-kul lake. Although it was the warmest season of the year (July), our thermometer only registered 10° Réaumur (54½° F.) at 9.30 p.m., and had fallen to 7° (47½° F.) by the morning.

We started at 6.50 a.m. in fine weather. At 9.10 a.m. we reached the top of Mount Koi-Tezek (14,000 feet), which marks the frontier line of Shugnan. During

six months of the year this mountain is covered with snow, and it is then quite impassable; in the summer, however, there is no difficulty. On the very summit the road forks, the right-hand branch leading to the valley of the Toguz-bul river, a tributary of the Gund, and the left-hand one to the Shakh-Dara valley. Here we halted, and after dividing up our baggage train our party split up, I myself being with the division which pursued the Shakh-Dara route.

We reached the Kok-bai plateau, which is surrounded by snow-capped mountains. We were now at a great altitude, many of our party suffering from incipient headache, and all were glad when the road, after turning to the left, descended along the banks of the stream Kok-bai-Chat, source of the river Shakh-Dara. Here we camped for the night, starting again at 7.15 a.m. As we proceeded, the character of the country gradually changed, and the scenery began to get more diversified. It was indeed time, for we were all heartily sick of the great "monotonous Pamir" which should furnish an ideal country for the pessimist if he is ever in want of such.

Indeed, for an image to express downright, utter melancholy, in the abstract cannot think of anything more apt than the picture of a pessimist reading Schopenhauer in the Pamirs. It is the "land of no hope." But although the scene was now more cheering to the eye, this was an advantage only purchased at the expense of weary limbs, for the roads went from bad to worse. We stumbled and fell, however, encouraged by the sight of wild-rose bushes and the warmer-tinted vegetation which bordered our route. A wild rose is perhaps not much, in an ordinary way, to make a fuss about, but to any poor wanderer, like ourselves, whose eyes were tired and aching from the monotony of a Pamir landscape, it will appear as it did to us, as a sign from God in the midst of the wilderness. But we still had to go through some wearisome plodding, for the road hereabouts is most precipitous. My heart knocked apprehensively against my ribs several times when my horse stumbled on the edge of some chasm or slipped in some deep rut on a breakneck descent. The best thing for a man to do in such cases is to trust implicitly to his horse; and not to attempt to control or guide it in any way, for the horse's instinct will be a surer and safer guide out of the danger than the judgment of its rider. Many a life has been lost, of horse and man, through humanity's insufferable conceit in its own prowess, and through its often ignorant contempt for the powers of the noble servant of man, the horse.

After a rough up-and-down scramble, a steep descent brought us to the confluence of the Koi-bai-Chat and the Mats. From this spot we had a truly splendid view of the distant snow-capped Wakhan mountains and the green valley of the Jaushankuz river, the latter being one of the sources of the Shakh-Dara. Of the Wakhan mountain range, two peaks tower pre-eminent, one rising to a height of 23,000 feet, and the other, the Tsaritsa Maria, to 20,000 feet above sea-level. These two majestic mountains stand adjacent and tower above all the others in their impressive majesty and might.

We soon came out into the valley of the Jaushankuz river, and thence to a place called by the Kirghiz Depchi-utun, "the trough-like." The path here became very steep and broken, but afterwards improved greatly. At this point we met ten Tajiks, who, hearing of the approach of the expedition, had come forward several versts* to meet us. Our guide, Azis-Khan, displayed much pleasurable excitement at meeting his compatriots, and when he came upon a second "welcoming party" a mile or so further on, his delight was at its height.

When they saw us, the Tajiks dismounted from their horses and took us quite

* One Russian verst = 0.6 English mile.

by surprise with the fervour of their welcome. On meeting with persons either older or of higher social grade than themselves, the custom is for the younger to take the other's hand and kiss it, to which greeting the elder responds by either kissing him on the forehead or throwing him a kiss, the whole performance being accomplished generally with dignity and grace.

The Tajiks, therefore, on meeting us ran up alongside our horses, took our hands, kissed them, and seemed to expect us to be as demonstrative as they were. It was only later on, when our interpreters had explained to them that we were unfortunate enough to have different customs, that they greeted us with hand-shakings and by making the "kulduk," i.e. a low reverence, performed with hands on breast.

By midday we had taken up our quarters in the tent prepared for us, and received numerous visits from Tajik-Shugnanis as well as from an influential family of Kirghiz then nomadizing in the district—that of Bai-Kurban-dakhta. In the time of the Khans, Kirghiz nomads, to the number of forty or fifty families, regularly made their homes in the Shugnan district, but now there are only about seven families there, and even those edge as near as possible to the Pamir deserts, so as to have a refuge handy against the Afghans. The latter swoop down on the higher reaches of the Shakh-Dara every now and then from Wakhan, where they garrison the fortress Kala-i-Bar-Panja, the capital of the Khanate of Shugnan.

The intervening country is very precipitous, and is icebound for three to four months in the year. Indeed, it is only the great difficulty of communication which has hitherto protected the Kirghiz from being forced under the sway of the Afghans. As it is, the latter have only thought fit to demand that the Kirghiz shall maintain a post of observation on their behalf, and inform them of everything worthy of notice—especially regarding the actions of the Russians on the Pamir.

As the entire garrison turned out and greeted us with every demonstration of friendship, their faithfulness to their charge, I am afraid, is more assumed than real. We made a halt near by the demolished Kirghiz fortress Butenek-Kurgan on the rivulet Jaushankuz (*Anglicè*, "sown barley"), formed by the junction of the Kok-bai-Chat and Mats. The name is appropriate, and not merely poetical, because, as a fact, barley-sowing actually begins here. Most probably this Butenek Kurgan, like all the others of which we have occasion to mention, was a place fortified by the Kirghiz so as to serve as a defence from their Tajik persecutors.

In the times of the khans, or, as they were called, "Shah" (ruler), these Tajik invasions were looked upon as such matter-of-fact enterprises, that even the Shah himself would not scruple to enrich his coffers by the despatch of a marauding party or two. In fact, these raids came to be looked upon as so many legitimate commercial expeditions, combining personal gain with the pleasures of war, without any of its dangers.

The Jaushankuz valley, which widens at this part, is encompassed by low mountains, quite bare, alike of vegetation and of snow. The soil, though rather marshy, is covered with a rich grass, dotted here and there with willow bushes, averaging 6 feet in height.

We started at 9.30 a.m., accompanied by an enthusiastic and increasing crowd of Tajiks and Kirghiz. The road first traversed the plain, but soon led us to a ford across the river. The latter here takes a sharp bend to the right. After crossing the river we entered a large defile, at the mouth of which stand a number of peculiar stone masses bearing a rough resemblance to Kirghiz "kibitkas" (dwelling-tents). Regarding the latter there is a legend which says that they mark the site of a former rich "aul" (village). A holy man wandered in one day craving rest and food, but the rich inhabitants, who had waxed proud in their

prosperity, repulsed him with scornful words. The holy man thereupon, angered at their shameful forgetfulness of the laws of hospitality as enjoined by the prophet on all the faithful, changed their kibitkas into stone.

On the right-hand side, we soon come to a ravine which bears the characteristic name "Duzakh-Dara" (hell's ravine). This is quite a misnomer, if the much quoted dictum, "*Facilis est descensus averni*," is right, for the road which leads through this ravine is most difficult. Right opposite the ravine Duzakh-Dara in the centre of the Jaushankuz valley, may be seen ruins of the old forte Jaushankuz-kala.

After ascending a small ridge a little further on, the ruins of an old Shugnan village became visible. The road then led us through a small stone ravine, and thence continued along the Jaushankuz valley again, to the junction of the river with the Vrang. From this junction, in reality, commences the river Shakh-Dara. Here we were met by the Shugnan Khudoyar, who acts as "aksakala" (governor) over Shakh-Dara, having been appointed to the office by the Afghans when they took possession of the country.

Khudoyar is a tall, fine-looking, energetic man, with the characteristic features of the Pamir-Tajiks. Barred from any but casual intercourse with the surrounding countries by almost untraversable mountains and the neighbouring desert, the Tajiks of Shugnan were forced to intermarry among themselves, and thus to keep pure, though debilitated, their original Aryan blood. Another thing to strengthen this isolation was the fact of their being "Shiites," who are heretics, and worse than dogs in the opinion of the surrounding Sunites. Khudoyar was accompanied by a "jiguit," a tall, fine young fellow, dressed in the gray uniform of the Afghans, with bright buttons, carrying a curved Afghan sword. I could not help looking on him with suspicion, and the more I looked, the less satisfaction I got from his cunning, evil-looking face. He disappeared soon—"gone home," we were told—and that was all the information we could glean about him.

Eventually we got quite accustomed to the various uniforms, but at the beginning the sight of them raised rather uncomfortable feelings.

Having passed the ruins of the "kishlag" (encampment) Vrang, we rode along the left side of the Shakh-Dara, sometimes making our way over bare rocks which overhang the water, and sometimes through willow bushes, till we reached the ancient fortress Koi-Kuvat. According to local tradition this fort was erected 700 years ago by the Amir Koi-Kuvat; and its strategical position, built as it is on an almost perpendicular rock, was certainly very well chosen. At the present the old fortress walls enclose several huts, "saklya," which serve as winter quarters to Kurban-Datkha and his numerous family. The surrounding country is very beautiful. The river valley broadens out, and is rich in vegetation. Here we stopped for the night.

July 24.—A beautiful summer morning. Though still early, the southern sky was so hot, that some of us sought the friendly shade of the willow-clumps, where we could tranquilly lie and gaze our fill at the beautiful landscape before us. The bright emeralds of the valley at our feet, made brilliant by the changing glow of the sunlight, and the outlines of the mountains standing out clean-cut against the blue sky, whilst the river wound its way in between, all combined to make up a picture from which we were loth to move.

When the time fixed for the halt had expired, it was very unwillingly that we rose to our feet and prepared to continue our journey.

A little further on the road passed to the right bank of the Shakh-Dara, and had to cross a deep ford. Further on, about half a mile from Baba-Abdal-Mas, which was agreed on as our night's halting-place, we had again to ford another

river, the Baba-Abdal, an affluent on the right bank of the Shakh-Dara. This was altogether a disagreeable business, the waters being rather deep, and the current rapid and boisterous. As if these disadvantages were not enough, the bed of the stream, moreover, was strewn with big stones, and we had several narrow escapes from accidents. We stopped on the bank of the Shakh-Dara, in sight of the burial-place of Baba-Abdal. This holy man is so revered by the inhabitants that many of those accompanying our party descended from their horses and walked past the tomb as a sign of respect. The burial-place stands on an elevation, and is visible some distance off. The exterior is quite ordinary in appearance, and the interior consists of two rooms and a terrace. Long poles stick up over the roof, hung with tails of yaks and different-coloured rags—remnants of pious offerings from the faithful.

A little lower down the slope stand the ruins of a "kishlag," by all appearance not long abandoned. We arrived at our night's camp at 11.45 a.m., and prepared for a lengthened rest, as the Tajik guides told us that the next place where we could put our horses to grass was some distance off. As the country was quite unknown to us, we had to rely entirely on the guides, which we could do with the more confidence, because it was as much their interest as ours to lead us as quickly as possible to the confluence of the Shakh-Dara and Gund, the rendezvous where our two reconnoitring expeditions were again to join. The longer they delayed, the more anxiety they would have on account of the Afghans. During the remainder of the day I visited the sepulchre, the ruins of the kishlag, and the ravines of the river Baba-Abdal.

July 25.—We started at 6.45 a.m. on our difficult journey to the first Shugnan kishlag, Seij, on the right bank of the Shakh-Dara. The difficulty and danger lay in the fact that we had to wade four times across the river, which was at rather high water. The road follows first a terrace, slightly sloping towards the river, and after passing a meadow goes through a thicket of willow trees, then ascends a slope, descends to the meadow again, enters a thicket of brushwood, and finally, $2\frac{1}{2}$ miles from Baba-Abdal-Mazar, runs close under high perpendicular rocks, which make it impossible to follow the right side of the river any further. As the ford was difficult, and would take some time, we resolved, after crossing, to wait till all the beasts of burden had arrived, and to see ourselves the most valuable bales and packages transferred safely across. The waiting would have been very dreary but for one incident, which, although rather unpleasant, served to pass the time. A pack-horse, carrying two cases of cartridges and a small barrel of spirits, slipped from the slope into the river. Through the efforts of the Tajiks, amongst whom was Azis-Khan, one case of cartridges was eventually saved, but the other sank in deep water and was lost. As regards the small spirit-barrel, that floated, and ten or twelve Tajiks immediately rushed into the water at the ford. By spreading themselves across the river they caught it, as it came down the stream. We regretted the loss of the cartridges, but the cossacks and soldiers regretted the spirits more, which had leaked out and become diluted with water. This cask was part of the very little we had remaining, hence their sorrowful looks. The crossing of the baggage and of the foot-soldiers took two hours and a half, and it was only at 10 a.m., *i.e.* after three hours and three-quarters, that we were able to continue our journey.

An hour after we had to recross the Shakh-Dara, which divides here into two streams. This made the fording easier, as, although the streams were still deep, the current was not so strong.

We halted once more amongst great thickets, "tugai," of poplars and willows. At 12 o'clock we continued our journey. The path now mounts up to

490 feet above the river, with abrupt descents and ascents, often across transverse gullies. On the left side can be seen the enormous Indich Bashur, hemmed in by precipitous cliffs, from the two clefts of which appear the peaks of the Wakhan mountains, covered with eternal snows; and below the mountains flows a small rivulet which falls into the Shakh-Dara. Right opposite the Indich Bashur, on the right side of the Shakh-Dara, there is a small kishlag, abandoned by its inhabitants, as we were told by the Tajiks, only last year. Having passed the Indich Bashur, we rode out on to a kind of level platform, where we met a friendly party of Tajiks, bearing a letter to us from the inhabitants of the lower kishlag, praying us to hasten. We now pushed on with all the speed which the difficult path would allow, and at 2 p.m. arrived at the third crossing. This proved to be the deepest, the water reaching to the saddle-cloths of our horses, besides which the bed was rough and stony. The breadth of the river here is about 60 feet. Hardly half a mile further on we had to cross again to the right side of the Shakh-Dara, but this time the ford was the shallowest and most convenient of all, and the bed quite even and firm. After this the road wends its way between enormous masses of stone, or on narrow ledges with walls so close to the rock that our stirrups grated on them as we went along. At last we began to ascend a very steep gradient on the bare rock, so steep and narrow that in some places steps had been hewn out and "balconies" constructed, i.e. widenings of the path by planks laid down and hanging over the precipice. We had been told about the fords, but not a word about this place, which proved to be the most dangerous on the whole road. In one place the rock wall projects so much over the ledge that our horses could not pass through, and we were obliged to carefully alight, take off the loads, and even to unsaddle the horses. Neither my companions nor myself shall ever forget this awful passage. Several Tajiks from Seij met us here, and helped us carry our luggage. Their agility, diligence, and, above all, the stamina they displayed in carrying heavy burdens weighing 144 to 180 pounds were really wonderful. If it had not been for their help we should have been delayed here for several hours, but as it was we did it all in about half an hour.

A short ride brought us to the mouth of the river Drum, which flows into the Shakh-Dara. We halted here about 5 p.m. on a small spur jutting between these two rivers. Our hazardous journey had tired me thoroughly out, not so much physically, but on account of the strain on the nerves. I therefore postponed my inspection of the neighbourhood till the following day, and went to rest.

We were now approaching the Afghans, and had to be on the *qui vive*, especially when bivouacked, in order to guard against surprises. We had carefully chosen the position for our halt on this account, and having the water on both sides, and above us the perpendicular rocky banks of the river, 50 to 70 feet high, we felt quite safe from any night attack.

The only difficulty we were under was through the absence of green fodder, which put us under the necessity of buying hay from the inhabitants of Seij.

The night was fine and warm, with a light wind blowing up the valley. Having left our cold altitudes now, we hoped, for good. Towards evening, a band of excited Tajiks brought us the disquieting news that the Afghans were advancing in two columns from Kala-i-Bar-Panja, up the Shakh-Dara and Gund, to meet us. We had therefore to prepare for the worst.

July 27.—At 7 a.m. we cautiously set out to continue our journey. After having first crossed a rather well-preserved bridge on the right side of the Drum and afterwards another bridge on the left side of the Shakh-Dara, the road began to ascend steeply till we at last emerged on to a small stony square platform 120 to 150 feet above the level of the bridges. Higher and higher we

went, till we came out on a second platform. All traces of a road had now disappeared, and even the path was sometimes hard to trace. This was all tiring work, and having rested a few minutes, we began the third and most troublesome part of our ascent. This proved simply cruel, what path there was being covered with needle-pointed flints which were torture to walk on. We had to dismount, as the path crumbled away under the weight of our horses, and many a slip sent rocks and stones and soil rolling down the slopes. In many places the ascent was so steep that steps had been hewn in the cliff, which we walked up as on stairs. The fatigues of this ascent, in fact, transcend description. Really we had to stop every five or ten steps to take breath. In cases like this the best thing to do is to let the horse go in front, and for the man to be half-tugged up, holding on to its tail. This we did. If the ascent was so difficult for a horseman, it is easy to imagine how much more difficult it became when we had to help to drag up all our baggage. We were often obliged to unload the pack-horses and to carry the baggage over the most difficult places parcel by parcel; and even when we could load up the luggage again, the task was more often than not very dangerous on account of the narrowness of the path, bordered by a perpendicular cliff on the left and a precipice on the right. At last (at 9.45) we arrived at the summit, all of us more or less exhausted, with throats parched, and trembling all over from the strain. We could still look back and see the struggles of our companions. In one place a large load had slipped from the back of a horse to its hind quarters, together with the pack-saddle, and the horse was prancing with fright, to the danger of all surrounding it; in another place some loads had fallen down, and the "kerekes" (guides) were struggling, some to put them on the restive horses again, others to drag them forward themselves. It is a miracle to me, however, how we managed to get through without a serious accident.

Having rested a little, we went on again, and were soon descending the slope leading to the Shakh-Dara at the spot where the river Badjan-Dara joins it. The descent is here, if anything, more precipitous than the former ascent, going down no less than 1000 feet; but, being a descent, we accomplished it without much difficulty along a path which had been specially laid out for us by Tajiks sent from Seij the day before, and to whom we had lent our spades and mattocks for the purpose. We rested at the foot amongst the enormous poplars and willows of a great "tugai" (grove), at the bottom of a deep valley surrounded by cliffs, and bearing the name of Kara-Dangue. On two sides we had the Shakh-Dara river and its affluent on the left side, the Badjan-Dara, and on the others there was the rocky declivity we had just descended. The cliffs here almost overhang the stream, and the sombre grandeur and gloom of the scene weighed heavily on all of us, so that we would willingly have chosen a more cheerful resting-place if the choice had been given us.

It was in this gloomy place that we received a letter from the chief of the Afghan detachment, then stopping at the fortress Rosh Kala, a little distance from our bivouac, literally gorgeous with all the flowers of Persian speech. To have read his compliments and the wordy welcome we received, any one unacquainted with Afghan ways would have imagined we were long-lost brethren; but as we knew that the Afghan praises most those whom he means to kill, the letter had no other effect on us than to make us exercise greater vigilance. The reader will see further on that we were right in our interpretation.

Our baggage train had not yet arrived, when darkness settled down on us like a funeral pall. A cool wind fanned us from the snowy heights of the Wakhan mountains, whose outlines were lightly silvered against the purple-black sky by the pale crescent of a young moon. Our tired men had dined hastily, many falling

asleep as they ate, and lay sprawling about in all sorts of ungainly postures. On account of the proximity of the Afghans and the obvious disadvantages of our position, we posted several foot soldiers as sentries on the ridge of the slope, which was the only place by which we could have been surprised.

In spite of my own fatigue, I could not get to sleep. The gloomy genius of the surroundings seemed to weigh on me, and the most hopeless thoughts thronged through my brain, and made me utterly miserable. "Out of the depths have I called unto Thee, O Lord!" The sombre, grand old psalm sank deep into me, and I felt a little perhaps of what our Aryan ancestors felt—fear of the unknown, the vast, illimitable nature surrounding us! Only the rhythmical gurgle of flowing water and the mournful sighing of trees rocked by the wind broke the heavy black silence. At last I fell into a troubled sleep, and when I woke again—what a relief! All was noise and bustle, and in the general hurry-scurry of my fellow I soon forgot the terrors of the night.

July 28.—A memorable day. We continued our journey at 7 a.m., and crossed the Badjan-Dara. This was comparatively easy, as the mountain-river rarely contain much water in the early morning. We had some more difficult ascents to get over, however. The first half of the one we now faced was not so steep but that the loaded horses and ourselves could ride up; but the second half was like a huge irregular staircase up a slightly slanting cliff. Here we experienced a renewal of our old troubles; but thanks to our men having in a measure gained fresh strength, and to the help afforded us by a number of willing Tajiks who had come to meet us, we made much better progress. We had to be careful also not to overtire our men on account of possible events.

In an old number of the journal *Razvyedchick*, I remember once reading an article on the training of German cavalry. One part described the exercises by which they were taught to ride over different obstacles in the road. Among others I remember that one exercise was to ride "upstairs" and down. This seemed to me very curious at the time; but now, since I had had my own share of riding "upstairs" and other unpleasantness, I could not help admiring the effectiveness with which the German military code seeks to prepare their cavalry for all sorts of emergencies. It is certainly worthy of imitation by other nations.

We soon rode into a large place, from which could be seen the far-off kishlag Sendip, the residence of our titled companion, Azis-Khan.

This was a glorious day, and the scenery truly delightful after the gloomy grandeurs we had just escaped from. On account of the proximity of the Afghans we had resolved to move forward, massed together, with the baggage in the centre. While our soldiers were making the necessary arrangements I took the opportunity of taking a peep at the kishlag and the surrounding country through my field-glasses. The kishlags of the Shugnanis generally consist of a collection of a few homesteads with fields, but not grouped close together. Each family generally consists of the father, mother, and married brothers. The "saklyas" (huts) of the Tajiks are made of stones, held together with clay, and look like so many rude cowsheds. These huts often have no windows, and the doors are always made very small, several boards being roughly nailed together. Light enters through a quadrangular opening in the ceiling, which can be shut by a shield; and this opening at the same time serves as an outlet for smoke. The fireplace, "ruüz," is built against one of the walls of the hut, and the sanitary arrangements are very imperfect. As there are no windows, the huts of the Tajiks are very dark, damp, and foul. Of furniture there is hardly any, and its absence is badly compensated for by wide shelves along the walls. On these shelves the inmates sit, sleep, dine, etc. The majority of Tajiks' dwellings are

very unattractive, although one meets here and there an exception—as, for instance, that of Azis-Khan, of which the woodwork is decorated with clumsy though quaint carvings, and the walls are evenly plastered, with niches for utensils, clothes, etc. The stables, cowhouses, farmyards, barns for seeds, cellars, etc., generally adjoin the huts. We could not help especially noticing the very curious buildings called “topkhana.” These are old quadrangular towers in which the inhabitants of the kishlags used to hide from the attacks of the enemy till relief came, or till the enemy got tired of waiting, or else starved them out. One often notices these “topkhanas” along the Shakh-Dara and Gund rivers. In one place on the latter there is a strong fortress, Chartym, consisting of seven such towers. The topkhanas were built generally on sites selected in the least accessible places. Of course, there was no artillery in those days, and the towers therefore generally answered their purpose very well. An entrance could only be effected through a small opening, made in the wall at such a height above the earth that a ladder had to be used. The defenders were at the top, and could fire at the enemy through embrasures.

At 8 a.m. we started. After leaving kishlag Sendip the road descends abruptly to the banks of the Shakh-Dara, and crosses an immense tugai over rather marshy soil. The trees grow so thickly here that at some places we rode through long vaults of green formed by the interlacing branches. The tugai ends just opposite the kishlag Denkent, and the road then gets bad on account of the small pointed stones with which it is strewn.

A little after one, after passing the kishlag Bar-vo-oz, we approached the kishlag Vez-dara, where it was resolved to put up for the night. As it was still early, we determined to leave the baggage train and the foot soldiers with directions for them to halt near Vez-dara, while we ourselves would go a little further on and have a look at the fortress Rosh-kala. We had been informed by the Tajiks that an Afghan detachment of about 120 to 150 foot soldiers and a few cavalry were stationed here; hence our curiosity. We only got a sight of Rosh-kala at 4 p.m. from a topkhana, after a wearisome ascent, of which we had not dreamt, having been told that the fortress was “not far.”

While we were passing the topkhana we heard the ringing notes of a trumpet from the fortress, sounding quick notes resembling our cavalry signals. This was followed first by a single volley, and then an irregular fusillade from the opposite side of the Shakh-Dara. The significant “ping” of bullets splintering the rocks and stones in our path made us aware of the fact that we were the objects of these little attentions from the Afghans; but it is somewhat incomprehensible that, notwithstanding the short distance and the large target we offered, not one of us was hurt. As we had the strictest orders to refrain from using our arms, we resolved to return. We were joined by our foot soldiers at the bottom of the descent. They had been hastening towards us on hearing the shooting from Vez-Dara, thinking we had fallen into some ambushade. On the night of July 28, our prospects of bringing our reconnaissance to a successful issue were not brilliant. We were no more than 5 or 6 miles distant from an enemy, numbering five times our men; and of what their sentiments were toward us we had just had proofs. The Pamirsky Post, from which we could obtain reinforcements, was about 180 miles distant, besides which the country was strange to us. We heard all sorts of contradictory rumours as to the Afghans; and lastly, we had not even the means for effectively defending our bivouac in case of attack, as we could only muster twelve foot soldiers and twenty cossacks. However, we did our best, and arranged officers’ guard, stationed our outlook posts and despatched cossack patrols, and also parties of Tajiks to reconnoitre. The Tajiks willingly offered their

services, which we were glad to accept. The night passed anxiously for all of us. When day broke we set about doing what we could to fortify our position, to get reliable information as to the intentions of the Afghans. How serious the position really was, may be judged from the fact that, two days afterwards the Afghans came to within a mile from us, and several times fired at us.

With July 28 began a series of wearisome days and nights, when we expected an attack at any moment. We had meanwhile received some reinforcements which put us on a more business-like footing, and enabled us to organize a satisfactory defence of the camp; but, nevertheless, we were not able to breathe freely until August 13, i.e. seventeen days later, when General Yonov arrived with a fresh detachment of infantry and cossacks.

On the following day, early in the morning, the Afghans, having learnt of the arrival of our reinforcements, hastily retreated first to Rosh-kala, and then further back to the left side of the Panj to the fortress Kala-i-Bar-Panja. As they retreated they destroyed in transit the bridge over the Shakh-Dara at Rosh-kala, and the state of the river rendered fording impossible, our detachment could only move to rejoin the Gund river reconnoitring party on August 20, by which date the bridge had been roughly repaired by the Tajiks. We were now penetrating into a country more and more under cultivation, but many of the fields had been either burnt or trodden down by the Afghans, to revenge themselves on the proprietors for going over to the Russians.

The fortress Rosh-kala, near which the detachment crossed to the right side of the Shakh-Dara, stands on a steep cliff. The south part of the cliff, which faces the river, rises to 1500 and even 2000 feet above the surrounding country. From this side Rosh-kala is quite inaccessible, but from the east and west sides it is, though with great difficulty, accessible. The north side faces the mountains on the right bank of the river, and is the weakest; but the fortress walls, made of stone, mount here to a great height. This cliff was the scene of the execution of the last independent ruler of Shakh-Dara, Mir Atam Bek, and his numerous followers who fought for their independence against the Shugnan ruler, Abdurhaim Khan. By order of the latter these unfortunate men were precipitated from the heights of the cliff and dashed to pieces on the stones lying at the cliff's base. Rosh-kala has many shelters erected for men and horses. Having taken advantage of these, the Afghans had ensconced themselves to their own comfort and convenience, and had many bitter regrets for not having arrived before them. An immense view of the surrounding country can be seen from this cliff, and the kishlags, picturesque villages, scattered on both sides of the Shakh-Dara, viewed from the great eminence, look like small toys.

The nearer we approached the mouth of the Shakh-Dara, the denser grew the population, and the more comfortable the roads. The two rivers, Shakh-Dara and Gund, on joining, form the river Kharokh, which runs its course of about 3 miles, and then joins the river Wakhan Daria, thus forming the river Panj. The valley of the Kharokh is cultivated in sections belonging to different proprietors who separate their lands from each other by small stone walls.

To get over to the right side of the Kharokh one has to cross the Gund river by a bridge situated a few thousand yards from the place where the Gund joins the Shakh-Dara.

Having joined the Gund reconnoitring expedition here, the whole detachment took up its position in several gardens 2 or 3 miles from the mouth of the Kharokh, and remained here until September 15, waiting for further orders. The interval was spent in reconnoitring the country, also the roads down the Panj to Roshan, and to the locally celebrated ruby-mines; and also in studying the Tajik

their ways of life, and the numbers of the population in Shugnan, etc. The position we occupied in the valley of the Kharokh offered many conveniences, and if at some future time we should have to maintain a garrison in Shugnan, and to erect a fortified position there, this place should undoubtedly be chosen.

About 3 miles lower down the Panj, on the left bank of this river, stands the fortress Kala-i-Bar-Panja, the capital of Shugnan, which is also known as Ak-kurgan on account of the white (*ak*) cliff on which the fortress walls stand. These walls, as also the greater part of the interior of the fortress, can be easily seen from the right side of the river, as they stand within rifle-shot of the mountains. This latter fact nullifies the importance of Kala-i-Bar-Panja as a strategic position.

On the right (Russian) side of the Panj are about fourteen kishlags. The whole country is rather densely populated, and the inhabitants are fairly well-to-do. The climate is so mild that even vines grow here, and are cultivated by the Tajiks. A nearer acquaintance with the Tajiks, and the study of their customs and manners, forces us to sympathize with this persecuted nation, which has gone through so many trials. Indeed, it is a wonder how it is they have not disappeared from the face of the earth. In far-off times this nation turned their eyes towards the north, to the Russians, and waited patiently for the occasion when they might become subjects of the great white Tsar, and thus free themselves from the persecution of the Afghans. This desire to be under Russian government, which was one of the principal reasons why the Afghans persecuted them, did not weaken as time went on, notwithstanding that their hopes were not soon realized. With the appearance of the Russians on the borders of Shugnan in 1894, it seemed that the end of their miseries had come, but fate has once more mocked their hopes, for, as we could not gain permission to leave even a small garrison to winter in Shugnan, we had to return. This we did *viâ* the Gund valley on September 15, followed by a great number of Tajiks and their families. The latter were forced to migrate in anticipation of revengeful reprisals from the Afghans, which would undoubtedly follow their having extended such a friendly welcome to us.

The general character of the road in the Gund river valley is the same as in the Shakh-Dara river valley, but the river is impassable, and the inhabitants have therefore been obliged to erect bridges in several places. Our detachment soon arrived at the summit of Koi-Tezek and re-entered the inhospitable Pamir, and on September 24 reached again the Pamirsky Post from which it had started.

THE MONTHLY RECORD.

EUROPE.

The River System of North Wales.—An attempt has lately been made, in an article contributed by Mr. Philip Lake to the *Geological Magazine* (May and June, 1900), to elucidate the origin of the river system of North Wales, on the lines so successfully followed by Mr. Marr in reference to the English Lake District. The writer begins by a study of Bala lake (sounded by him in 1899) in its relation to the neighbouring valleys, showing that the discharge of the lake into the Dee is not what the general topography of the district would lead us to expect. The lake lies, in fact, not in the valley of the upper Dee, but in the well-defined valley which runs north-east from Barmouth to the town of Bala, and is shut off from the vale of Edeyrnion (the Dee valley between Llandderfel and Corwen) by a ridge of hills traversed by the gorge in which the Dee now flows. That the drainage of the district once flowed continuously from north-east to south-west, past the site

of Bala lake, into the valley of the Wnion, is indicated also by the apparent slope of the lake-floor in that direction, and by the existence of an extensive alluvial plain at the present foot of the lake, even larger than that now being formed at its head. Mr. Lake shows that in the direction of the Wnion valley there is no evidence that the lake is rock-bound, but that the old channel was probably blocked by drift, the reversal of the drainage being due, however, in part, to Earth-movements. The lake and valley adjoining it to the south-west lie in a trough between faults, which seem to have played an unusually important part in the production of the present topography, the present low watershed across the valley corresponding in position with other, oblique, faults. Passing to the consideration of the general drainage system of North Wales, the writer draws attention to the important series of deep valleys running for long distances from north-east to south-west, although interrupted, in certain cases, by low watersheds. The most marked of these lie on a straight line running from Ogwen lake to the head of the Wnion valley, and their position is probably due to Earth-movements. The valleys referred to cut up the whole country into parallel strips drained (generally southwards) into those valleys by another system of streams, the units of which can frequently be traced from one strip to the next, and which appear to represent a former drainage system, radial in character, having its centre near the sources of the Conway. This system—very similar to that now in existence in the Lake District—seems to have been subsequently modified by the formation of the present transverse valleys, in one of which Bala lake was formed.

Influence of Latitude on Plant-life in Germany.—Prof. Ihne, of Darmstadt, who has paid much attention to the phenomena of plant-growth as influenced by locality, and has superintended a careful series of observations in Germany for the purpose of elucidating the question, sets forth, in the seventh number of the *Geographische Zeitschrift*, the results obtained as regards the influence of latitude on the dates at which spring is announced by the bursting into flower of various typical trees and shrubs. By the method adopted, which is described at the outset of the paper, the first appearance of the leaf (though recorded in the observations) has not been taken into consideration, owing to the greater difficulty of obtaining a trustworthy record of this than of the dates of flowering, while, given careful observation, the results arrived at may be taken to be the same. Mathematical accuracy is, of course, not to be expected, and the results as a whole are not invalidated by the impossibility of selecting stations at which observations for a sufficient number of years have been carried out, and where other factors besides latitude—longitude, altitude, exposure, soil, etc.—are the same. In his present investigation, Prof. Ihne has chosen localities differing as little as possible in these respects. All lie more or less in a line from north to south, the average difference of longitude being only 46 kilometres (28½ miles); and from his previous researches into the influence of longitude on the phenomena in question, which showed that for stations of moderate elevation in Central Europe, the advent of spring is retarded by 0·95 day for every 111 kilometres (60 geographical miles) in an easterly direction, Prof. Ihne shows that such a difference may well be left out of consideration. From the differences observed in the case of eight pairs of stations, which, when reduced to the unit of 1° of latitude (111 kilometres), show intervals of time for that distance varying from 3·4 to 4·6 days, Prof. Ihne arrives at the conclusion that for every additional degree of latitude the advent of spring is retarded by about four days.

ASIA.

Burma-Sechuan Railway Survey.—Among the many railway projects set on foot within the past few years for the opening up of China, one of the most

important from the point of view of Great Britain is, as is well known, that for a line from Burma, in continuation of the railway already constructing to the Kunlong ferry on the Salwin, through Yunnan to the province of Szechuan, the wealth of which it is hoped to tap by this means. A survey of the proposed route was carried out about eighteen months ago on behalf of a British syndicate—"The Yunnan Company"—by Captain Davies and Lieut. Watts-Jones, working from the side of Burma, and Captain E. C. Pottinger starting from the Yangtse river. An account of his survey was given by the latter officer in February last at the Royal Artillery Institute, in the *Proceedings* of which body (April, 1900) a report of the lecture appears. Captain Pottinger was assisted in the work by Lieut. Hunter, R.E., and, until his death at Chungking from inflammation of the lungs, by Mr. L. Tucker, son of General Tucker, now in South Africa. Two native Indian surveyors also accompanied his party. During the voyage up the Yangtse, Captain Pottinger executed a survey of the rapids, while the surveyors landed frequently and sketched in as much as possible of the adjacent country. The serious work of the expedition began, however, only after arrival at Chungking, when it became necessary to decide on the line to be surveyed from the Yangtse to Yunnan-fu. The intervening country is exceedingly difficult, and the general consensus of opinion has hitherto been that it would be quite impassable for a railway. By the principal trade routes, the shorter of which reaches the river at Sui-fu, this seems to be the case, and even the telegraph route which starts from Lu-chao presents great difficulties, rising abruptly from 1000 to 5000 feet, falling to 2000, and again ascending to 8000. Tunnelling is out of the question, as what appear to be mountains are in reality the escarpments of tablelands, while the rivers often run in corkscrew gorges, with a drop, in places, of 500 feet in half a mile. However, by leaving the main road and exploring the adjacent country (of which existing maps are in places 40 miles out), Captain Pottinger at last found what he considers a practicable route. A tributary of the Yangtse was followed up as far as Yung-ning, beyond which the whole country begins to rise rapidly, the formation changing from sandstone to limestone, with coal outcrops all over the hills. The country becomes very irregular and broken, rivers and streams flowing in deep limestone gorges, disappearing underground and again emerging in the most confusing manner. There are many blind valleys and hollows, the drainage water escaping underground, and even from hill summits it was often impossible to estimate accurately the run of the rivers and ranges. Captain Pottinger was much struck by the absence of timber, every tree and shrub having been destroyed for firewood, so that stalks of poppies, sedges, etc., are now dried and used for that purpose. The people are, however, beginning to appreciate the advantages of coal. Bamboos are grown in the villages and used for all building purposes. In the mountains some of the Miao-tzu aborigines were met with, the women still retaining their tribal costume, though the men wear Chinese dress and are rapidly losing their original characteristics. The Burma party was finally met at Weining, and the main object of the expedition was completed. Captain Davies returned *via* Tongking, while Captain Pottinger and Lieut. Hunter worked their way back to the Yangtse by different routes, surveying as large a tract of country as possible. During the four months spent in the hills there had been hardly twenty days without rain.

Himalayan Ascents.*—In their recently published volume, Dr. and Mrs. Workman give a personal narrative of two summers' travel among the peaks,

* 'In the Ice World of the Himalaya.' By Fanny Bullock Workman and William Hunter Workman. London: Fisher Unwin. 1900.

passes, and glaciers of the Western Himalayas, with a brief account of an abortive autumn expedition into Sikkim. In the first season, 1898, the travellers cycled to Srinagar, which they made their starting-point for a tour among the mountains of Ladakh, Nubra, and Suru. In 1899 they adopted a more ambitious programme, securing the services of the well-known guide, Mattia Zurbriggen, and accomplished some pioneer ascents in Baltistan, in the vicinity of Askole, near the foot of the Great Biafo glacier. The peaks ascended varied in height from 18,600 to nearly 21,000 feet, and the difficulties encountered taxed all the energies of the travellers, experienced mountaineers as they were. The authors regard as a complete delusion the idea that, apart from their altitude, the Himalayas are easy mountains to ascend, giving it as their opinion that many of the peaks will never be scaled by any creature without wings. The book makes no pretensions to scientific value, but the views and descriptions give a good idea of the sublime scenery of the snow-capped Himalaya, while Dr. Workman's remarks on the physiological effects of high altitudes are of some interest. Some additions to and rectifications of the map were made, especially by the discovery of a large crescent-shaped glacier south-west of Mango Guzor, the highest of the peaks ascended. In the absence of native names for the features described, the travellers have given to these names of their own, which are not always felicitous. The appellation Siegfried bestowed on one of the peaks ascended, sounds decidedly out of keeping with the surroundings. The explanations of Indian terms given in a short glossary are in several cases inadequate, if not misleading.

The Trade of the Persian Gulf.—The report for 1899, by Lieut.-Colonel Meade, on the trade of the Persian gulf, records an improvement as compared with 1898, though less than had been anticipated, owing to failure of rain towards the end of the season. This affects the export of cereals, on which the trade of the region largely depends, and which will have assumed larger proportions during the present year, as an abnormal harvest was expected. At most of the Persian gulf ports India heads the list, both of imports and exports, while, except at Bushire, the direct trade with the United Kingdom is but small. Apart from local trade, the only other countries having any large dealings with the Persian gulf are China, which takes opium from Bushire to the value of £285,000; and Turkey, whose trade is principally carried on with Bahrain. From that port pearls were exported in 1899 to the value of £454,900, as compared with £299,500 in 1898, and from the Arab coast ports to the value of £516,600, as compared with £343,500 in the former year. As regards shipping, Great Britain still practically holds a monopoly in the gulf, that of all other European nations being quite insignificant. Turkish shipping is represented principally at Bahrain and Bushire, while the trade between the Arab coast and Persian ports (principally Lingah) is chiefly carried on by Persian vessels. The rest of the local trade is mainly in the hands of Arab and Muskat owners. The report of the Vice-Consul at Mohammerah announces the re-opening of the direct trade-route from the Karun to the north of Persia, and also the completion of the new Ahwaz-Ispahan mule road, so that an increase in trade by the Karun—which in 1899 showed a falling off—may now be expected.

Map of Afghanistan: Correction.—In the map of Afghanistan published in the November number of the *Journal*, the Russian railway from Merv to the Afghan frontier is made to terminate at the Jamshid capital Kushk. This is an error. It terminates at the Russian station of Kushk, which is on the river of that name, at (or near) the point where the river intersects the Russo-Afghan boundary. The two places are quite distinct, and it is unfortunate that they should be called by the same name, although doubtless the Jamshidi Kushk has long been overshadowed by the Russian settlement.

Cession of Spanish Islands to the United States.—By a convention signed in Washington on November 7, the small islands of Cagayan Sulu and Sibutu off the north of Borneo, which had remained in possession of Spain, are made over to the United States in consideration for the payment of \$100,000. The islands formed the last remnant of the Spanish empire in the far East.

The Khotan River.—In Captain Deasy's paper, p. 513, *antea*, the title of the illustration should be the *Sources*, not the *Sands*, of the Khotan river.

AFRICA.

The Blanchet Expedition: Death of the Leader.—The fuller details now received respecting the detention of M. Blanchet and his European companions on the borders of Adrar (*ante*, p. 227) give the affair a somewhat different complexion from that suggested by the first reports. The travellers received throughout the cordial support of the King of Adrar, Moktar uld Aida, who did his utmost to protect them during the disturbances which led to the flight of the French escort. After a virtual captivity of over two months, the steps taken by the French authorities to secure their release proved successful, and the expedition returned to St. Louis at the end of September. We regret to state, however, that M. Blanchet almost immediately (October 6) succumbed to yellow fever contracted during the journey to Dakar. A short preliminary account of the journey, to which we hope to recur shortly, appears in the new number of the *Annales de Géographie*.

The Northern Territories of the Gold Coast.—This name has been given officially to the latest territorial acquisitions in the Gold Coast Protectorate, lying north of Ashanti roughly between 8° and 11° N. lat. A large amount of information on these territories—a *terra incognita* until quite recent years—has been collected by officers of the administration, but little has hitherto been published. The recent issue by the War Office of a report, compiled by Lieut.-Colonel H. P. Northcott, in which the information so collected has been embodied, is therefore particularly welcome. It begins with a clear sketch of the geography of the territories, which lie wholly outside the belt of forest which extends about 200 miles from the coast. They form a gently undulating plateau, gradually rising northward from Kintampo and ending abruptly in a scarp facing north and falling very steeply about 700 feet, through a break in which the White Volta passes in its southward flow. North of the scarp is another plateau of a character similar to the first, but rising frequently into definite hills from 100 to 500 feet in height. The whole area is covered with coarse rank grass, burnt down annually, and dotted over with dwarfed and shadeless trees. The absence of large trees is probably due to the fires, for nearly every village possesses its "shade tree" (baobab, cotton, etc.), where are held the market and village parliament. The main river-system is formed by the Black Volta and White Volta, the former of which has no important affluents, the latter only one—the Kulpawn. These carry running water all the year round, and for four months are noble streams, but at the end of January they shrink to modest dimensions. During the dry season a scarcity of water is experienced in many parts. The basis of the soil is sandstone, covered in the lower levels with a thin layer of alluvium. In the hills granite and quartz are found. The report contains some account of the history of the native kingdoms of the territories, the principal of which is Mamprusi. This seems to have been founded by one Tosogo, who came west from Gurma about the beginning of the century, and conquered, besides, Moshi and Dagomba, which he placed under his brother and nephew respectively. Until recent years, a yearly present was made to the king of Mamprusi by the king of Moshi, whose election had also to be confirmed by the former. The lesser states of Wa, Bole, and Daboya seem to

have formed parts of the former kingdom of Yabum. The main trade of the region consists in the exchange of the cattle and sheep of the north for the kola-nuts of the south. There is some demand for European articles, and satisfactory results have followed from the establishment of Government stores at Wa and Gambaga, at which all payments are made in British currency. In the rainy season the White Volta would probably be navigable throughout the great part of its course by stern-wheel steamers, there being apparently only two sets of rapids forming a bar to navigation. The most important link in the chain of communication from the coast will be the proposed railway from Accra to Pong on the Volta, but motor cars, for which 70 miles of suitable road already exists, might prove of much value as a means of transport. Experimental gardens are needed to test the capability of the country to produce paying crops. The climate is appreciably better than on the coast, for though the heat is great in March, April, and May, the air is free from the oppressive moisture of the more southern districts. The report includes extensive vocabularies of the principal languages of the country. The map, which is based principally on the valuable work of the late Mr. Ferguson, shows the administrative subdivisions of the territory.

Organization of French Congo.—By a decree dated September 5 last, the northern territories of French Congo have been formed into an administrative province entitled "Territoire militaire des Pays et Protectorats du Tchad." This includes, firstly, the basin of the Kemo, a tributary of the Ubangi; and, secondly, the basin of the Shari and its affluents (excluding concessions already made), as well as the countries included within the French sphere by the Anglo-French conventions of 1898 and 1899, *i.e.* Bagirmi, Wadai, and Kanem. All these territories are placed under a commissioner, subordinate to the commissioner-general of French Congo. The latter functionary has under his immediate control all the territory of French Congo not included in the new province.

The Lemaire Expedition.—Captain Lemaire, leader of the Belgian Scientific Expedition to the Southern Congo basin, which left the mouth of the Zambezi in 1898, arrived on September 3 last at the mouth of the Congo, having effected the twenty-third crossing of Africa hitherto made in a little over two years. Some additional details respecting the geographical work done along the Congo-Zambezi watershed, with a map showing the routes followed, are given in the *Movement Géographique* for October 21 and 28. Captain Lemaire's Expedition from Lofoi, on the Lufira, to Lake Dilolo, was commenced on June 28, 1899, and on the return journey the watershed was followed with few intermissions from 22° to 27° E. long. (in part in company with Major Gibbons), being crossed no fewer than twenty-five times. The most important correction introduced into the map as regards the position of the watershed is its shifting to the north by more than a degree between the meridians of 24½° and 25½° E. As is pointed out by M. Wauters, the stream crossed by Capello and Ivens in 25½°, and taken by them to be the source of the Lualaba, must in reality bend back towards the Zambezi system, which thus receives a considerable northward extension. The sources of the Kapombo (Kabompo) and Lunga (not to be confounded with the Lunga of Capello) were found by Captain Lemaire to lie in about 11½° S. After the return to Lofoi, the expedition made its way by Mpweto to Lake Tanganyika, which was reached at Baudoinville on April 7 last. During his stay on the shores of the lake, Captain Lemaire took a series of astronomical observations which confirm the results gained by Mr. Fergusson, the surveyor attached to Mr. Moore's expedition. At Towa, the shore of the lake has to be shifted 50 kilometres (over 30 miles) to the west. From Tanganyika the expedition went west to the Congo by the usual route through the Manyuema country, which was found to be completely pacified,

the remainder of the journey to the Congo mouth being made by canoe, steamer, and railway. In addition to the careful surveys, the results of the expedition are of much value as regards meteorology, zoology, and botany.

AMERICA.

Currents in the Gulf of St. Lawrence.—The *régime* of the currents in the Gulf of St. Lawrence, as elucidated by surveys carried out during the years 1894 to 1896, is fully dealt with in a pamphlet published this year at Ottawa by order of the Minister of Marine and Fisheries. In the first half a description is given of the surface currents themselves, whether constant currents which run more or less continuously, in accordance with the general circulation of the water in the gulf area, or tidal currents produced or chiefly influenced by the tide. The second part treats of the causes which influence the currents in moving as they are found to do. The most important of the constant currents—one at the mouth of the St. Lawrence along the Gaspé coast, the other round Cape North on the west side of Cabot strait—are due to a general outward drift of the water of lower density, apparently derived from the outflow of the St. Lawrence river, which occupies the south-western half of the gulf. The Gaspé current usually occupies a belt of about 12 miles in width, lying from 2 to 14 miles off shore, in the vicinity of Fame point; but in certain cases it may be displaced or even reversed under the influence of abnormal winds. The Cape Breton current, on the west side of Cabot strait, flows almost constantly outwards to the south-east, while on the eastern side of the strait off Cape Ray there is usually a movement of the water to the north-west or inwards towards the gulf. On the west coast of Newfoundland there is an important current to the north-east, which is especially marked from the Bay of Islands to Rich point. In the strait of Belle Isle the current is essentially tidal in character, and there is no foundation for the belief that a constant current runs inwards towards the Gulf of St. Lawrence. At all three angles of the gulf the coldest water forms a layer between the depths of 30 and 50 fathoms, and this cold layer seems to extend very generally over the gulf area. Both this and the deeper water seem, however, to be quiescent. As regards surface density, the denser water, practically the same as that of the open Atlantic (1·0237 to 1·0242), occupies the north-eastern portion of the gulf, the dividing line running from Anticosti to the middle of Cabot strait. South-west of this line the density falls to 1·0220, and in the Gaspé current to 1·0210. In the deep layers it rises even here to 1·0261, which explains the fact that the colder water at 50 fathoms floats upon these. In tracing the general circulation of the gulf, the principle of the balance of flow must be kept in view. There is no confirmation to be found for the theory that a constant current enters the gulf by Belle Isle strait and leaves by Cabot strait. On the contrary, the total volume of water which leaves the gulf by the latter—vastly greater than the volume of fresh water received from the St. Lawrence, though this may be sufficient to dilute the water to the low observed density—is replaced principally by water which enters from the ocean at the same strait, in continuation of the general westward drift along the south coast of Newfoundland. The whole of such movements probably occur within a depth of 50 or 60 fathoms.

Influence of Wind on the Level of Lake Erie.—A recent number of the U.S. *Monthly Weather Review* (May, 1900) contains an interesting note by Prof. A. J. Henry on the fluctuations of level in Lake Erie brought about by the winds. In connection with the survey of the great lakes carried out by the Engineer Corps of the United States army, a continuous record of such fluctuations through a number of months has been kept, and as an equally full record of wind phenomena,

made at the Weather Bureau Offices at Detroit and Buffalo, is available, it is not possible to study the connection which exists between the two sets of facts. It has been known for some years that winds blowing parallel to the axis of the lake tend to heap up the water at the end towards which they blow, and to depress it at the opposite end, the heaping up of the waters in Buffalo harbour being at times a serious menace to wharf and dock property. The effect of the wind on the lake is well shown by the records kept during a storm moving north-east from the Mississippi valley. At Amberstburg the water first rose, then fell and rose again while converse oscillations were recorded at Buffalo. The fall at the latter and the rise at the former are due to the north-easterly winds in front of the advancing storm, while a second oscillation contrary to the first is caused by the shift of the wind to a westerly quarter as the storm centre advances along the lake. The amplitude of the oscillations may reach an extreme value of 6 or 7 feet. In the case of a storm passing due east across the lake, with resulting north-west winds, the oscillation was rather transverse than longitudinal. Prof. Henry thinks it may conclude that the oscillations are stationary rather than progressive, no wave of water being propagated, but the whole lake oscillating about a nodal line, which the fluctuations are zero.

Mr. A. P. Low's Explorations in Labrador.—In the *Journal* for 1898 (vol. xiii, p. 434), reference was made to Mr. A. P. Low's explorations, down the coast of Hudson bay, in December, 1898, on the east coast of Hudson bay. During the following spring and summer, Mr. Low and his assistant, Mr. Young, who had wintered at Great Whale river, continued their work, both on the coast and in the northern interior of the Labrador peninsula, considerable additions to our knowledge of both being made. A sketch of the results appears in the summary report of the Canadian Geological Survey for 1899. On February 23, Mr. Low started northward, travelling over very rough ice, and meeting many parties of Eskimo on their way to the Hudson bay post. The northern tree limit on the coast was found to be just north of Richmond gulf. On March 2 the coast was left about 10 miles north of the Nastapoka river, the country rising rapidly to about 700 feet. A number of small lakes are surrounded by bare rocky hills, this barren region extending inland about 30 miles, beyond which the valleys contain some soil, supporting clumps of spruce and larch. After crossing the watershed between Hudson and Ungava bays, Mr. Low descended to Tasiagaluk, or Eskimo Seal lake, said to be over 10 miles long, though nowhere more than 15 miles across. It has several narrow bays, all, like the main body, with an east-and-west trend, and at its eastern end it gradually narrows into the Leaf river, which is navigable by native umiaks down to Ungava bay. The surrounding country is comparatively flat, with low ridges of rocky hills. Failing to meet with caribou, Mr. Low was forced to return, and on April 3 started with Mr. Young and three others up Great Whale river. Progress was much hampered owing to the exceptionally mild and rainy weather, but the north branch of the river was surveyed to within a few miles of a large lake which discharges both by this river and by the Little Whale river. The Abchegamich branch, which was surveyed for 15 miles, comes from the north-east, while the main branch makes a circuit from the south and west, its upper course being only 20 miles from the coast. After again returning to the coast, the explorers made ready their yacht for the summer's use, and in it surveyed the coast from Richmond gulf to Rupert river, near the south end of James bay. Summarizing the geological and other results, Mr. Low says crystalline schists, gneisses, and granite occupy the greater part of the area examined, and that a band of unaltered rocks belonging to the so-called Cambrian of Labrador occupies most of the coast and islands from Portland promontory to Cape Jones. At Nastapoka islands the

contain large beds of iron ore, similar to that of the south of Lake Superior. Observations on the drift and glacial striae near Moose river tended to show that the source of the diamond-bearing drift of Wisconsin and Michigan may be in the Hudson bay region. The peninsula of Labrador was once completely covered with ice, the centre of dispersion lying first in the southern, afterwards in the northern interior. The land has risen at least 700 feet since glacial times, though no appreciable rise seems going on at present.

Glaciers of British Columbia.—Two papers have recently been published in the 'Proceedings' of the Academy of Natural Sciences of Philadelphia on the subject of glaciers in British Columbia, by Messrs. George and William S. Vaux, junr., with map and illustrations. These papers embody the results of several visits more particularly to the Illecillewaet glacier, which is dealt with at some length. It is pointed out that greater glacier development occurs in the eastern or inner ranges of the Rocky mountains, these being the highest and most rugged; so that cooling takes place more quickly than elsewhere, and the precipitation is very rapid. The Great or Illecillewaet glacier is situated within a short distance of Glacier House, in the heart of the Selkirk range. The immense *névé* which feeds it lies on the top of the range forming the divide, and from it several branches flow down into as many valleys. The Great glacier is notable for its freedom from dirt at its foot, and the remarkable rapidity of the ice-fall. Measurements of the rate of flow were determined at nine points on the glacier during 1899, and show a marked decrease as compared with the observations of the Rev. W. S. Green in 1888. They demonstrate the more rapid motion of the central portion of the glacier, and also that the ice on the convex side of the line of flow moves faster than on the concave side. Measurements made in the autumn of 1899 indicate a recession of but 16 feet for the year, as compared with 56 feet, the average of the past eight years; and an average daily recession of but $2\frac{1}{10}$ inches, as compared with $8\frac{1}{10}$ inches at the same period of the previous year. The Asulkan glacier is situated at the head of the valley of the same name, about 4 miles distant from the Glacier House. Its *névé* is connected with that of the Illecillewaet over the ridge which separates them. The two glaciers are said to have, at one time extended till they joined and flowed as a common ice stream. The Asulkan glacier was visited in August, 1899, but no marked changes had taken place in it during the year. The Victoria glacier, at the head of Lake Louise, Alberta, is apparently receding and contracting.

Physical Features of the Klondike Gold Fields.—The summary report of the Geological Survey Department of Canada for 1899 includes two or three separate reports, by observers in the field, which are of considerable geographical interest. That by Mr. R. G. McConnell, describing his examination of the auriferous portion of the Yukon district, which has also been issued as a separate pamphlet, forms the clearest account which has yet been published of the structure and physical features of the Klondike region. The pay-gravels hitherto discovered lie almost exclusively within the area bounded by the Klondike river on the north, the Yukon on the west, and the Indian river on the south. This may be described as a high plateau cut in all directions by deep and wide branching valleys. The outlines are rounded, and the ridges, which radiate outwards from the Dome, the highest eminence in the district (4250 feet), have a fairly uniform elevation of about 1500 feet above the valleys. The latter are wide and flat-bottomed in their lower parts, but narrow towards their heads into steep-sided gulches, which terminate abruptly in cirque-like depressions cut into the sides of the ridges. The valley-flats are marshy and partly wooded, the streams narrow, but rapid in their upper courses. The Klondike itself is a large rapid stream, averaging about 50 yards in

width, and interrupted by frequent bars. The Indian river is much smaller, being very shallow, while the channel is filled for long stretches with large angular boulders. The forest trees consist of the white and black spruces, the aspen and balsam poplars, and a species of birch; the white spruce (which, especially on the Klondike, is of surprising size and quality, considering the latitude, and can be easily floated down to Dawson) being the most important tree for general purposes. The ridges are, except on the higher points, covered with an open forest of small trees. The geology of the district is complicated, but four series of stratified and foliated rocks, mostly palæozoic, can be distinguished, as well as granite and other eruptives of tertiary age. Of the former, the Klondike river series, which occupies a zone from north-west to south-east between the Klondike and Indian river without, however, touching either, is the most important, as it constitutes the country rock along the productive portion of all the richer creeks, and is apparently genetically connected with the occurrence of the gold. The rocks are mainly light coloured and greenish micaceous schists, greatly crushed and altered, and almost certainly derived originally from eruptives. The gravels are classed by Mr. McConne under four heads, viz., stream gravels (present), terrace gravels, river gravels, and of valley gravels, the last-named including the remarkable deposit, very uniform from top to bottom, known as the quartz drift. It is formed of a compact mixture of small clear quartz grains, minute scales of sericite, and rounded or wedge-shaped boulders of quartz. Gold in paying quantities occurs in the stream gravels, the terrace gravels, and the quartz drift, and the aggregate length of the paying portions of the creeks, as at present known, is estimated at some 50 miles, while a moderate estimate of the gold included gives a value of about £19,000,000. Other sources will, however, in time be utilized. The report is accompanied by a map on the scale of 2 miles to 1 inch.

POLAR REGIONS.

Work of the Russian and Swedish Parties in Spitsbergen.—Further details are now to hand respecting the scientific work carried out in connection with the degree measurement in Spitsbergen, especially that of the Russian party, which met with a cordial reception from the Academy of Sciences on its return to St. Petersburg on October 21. Some account of the operations during the winter in which the observers were for nine months isolated from the rest of the world, is given in the *Deutsche Rundschau* (vol. 23, p. 45). Their work included astronomical pendulum, and hourly meteorological observations, as well as a careful study of the aurora borealis, with photographs of the same and of its spectra, the latter of which had never before been obtained. After November, snow-storms of great violence became frequent and caused much annoyance. In December the temperature was comparatively high—the mean being 23° Fahr., or higher than at St. Petersburg. The coldest day (−25·6 Fahr.) was March 4, while on April 13 the temperature was still −18·4 Fahr. Geodetic operations were commenced on March 31, and were continued with great activity in spite of unfavourable conditions. The work accomplished, which is of much value from a geographical point of view, is summarized in the tenth number of *Petermanns Mittheilungen*. The southern part of Spitsbergen was crossed in a variety of directions, the connection between the two coasts being established by way of Mounts Hedgehog and Keibau, on which the signals necessary for the triangulation were erected. It proved impossible to proceed north up the Stor fjord, but Mount Chydenius and the Svenberg were reached from the west coast, and the necessary signals erected. As has already been announced, the work remained incomplete, owing to the impossibility of effecting a junction with that of the Swedish party. Details of the

work of the latter are not yet to hand, but an interesting discovery was that of a mountain south of Treurenberg bay, which was found to have a height of 5580 feet, or 1180 feet higher than the Hornsundstind, hitherto supposed to be the highest summit in the whole of Spitsbergen. The new peak is said (*Globus*, vol. 78, p. 183) to belong to a range which appears to be connected with Mount Chydenius. Other unexpectedly great heights were found in the vicinity of Wijde bay.

Russian Expedition to Novaya Zemlya.—An expedition to the east coast of Novaya Zemlya has been undertaken by the Russian Lieut. Borissoff, who, after preparing winter quarters, passed through Matushkin strait into the Kara sea on August 13, for the purpose of establishing depôts of provisions for a sledge journey next spring. He hopes to make his way northwards along the coast, and complete the survey of the islands.

The Stein Arctic Expedition.—This expedition, as to the safety of which fears have been expressed in some quarters, has apparently extricated itself without mishap from its somewhat precarious position. The Austrian member of the party, Dr. Leopold Kann, arrived at Dundee on November 7, on board the whaler *Eclipse*, and from statements made by him it appears that the expedition has been fairly successful, having during the past summer made numerous excursions leading to an improved knowledge of Ellesmere Land. Details of Mr. Stein's movements have not transpired, but it appears that he was left by Dr. Kann at Cape York so far back as June 9. Visits seem to have been paid to his winter station, both by Peary and his assistants.

Suggested International Co-operation in Antarctic Research.—M. H. Arctowski repeats in *Ciel et Terre* the arguments which he brought before the British Association meeting at Dover,* as to the importance of wide international co-operation in the study of the atmospheric conditions of the antarctic area during the time when the forthcoming British and German expeditions are in the field. He points out that the laws governing atmospheric and oceanic circulation remain very obscure on account of the want of data from the antarctic area, and he emphasizes the importance of simultaneous and combined effort in obtaining records from a number of points on the margin of the south polar area. In 1902 the two expeditions will be supplemented in their work by the observatories of Melbourne and Cape Town, by the German station on Kerguelen, and by Argentine observers in the South Shetlands and at Staten island. He points out that there is still time to organize further co-operation, and that the need is urgent to investigate fully the meteorology of the stormy region of Cape Horn in particular. He suggests the establishment of a polygon of stations uniting South America and the antarctic lands, the suggested points being Punta Arenas, Staten island, Cape Pillar, one of the Diego Ramirez islands south-west of Cape Horn, the Falkland islands, South Georgia, the South Shetlands, and, finally, one or two stations in the lands discovered by the *Belgica*. He thinks that the Chilean government might be induced to send one or two meteorologists to the lighthouse at Cape Pillar; that France should send observers to Diego Ramirez; and that Russia, where neither men nor means are lacking for such an enterprise, should also co-operate.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Currents in Australian Waters and the Southern Ocean.—In the fourth instalment of current-paper statistics, placed before the Royal Society of New South Wales, Mr. H. C. Russell has to record an unusually large list of such papers

* *Geographical Journal*, xiv. (1899), p. 584.

received between September, 1898, and October, 1899. In the absence of north west winds, which had, during the preceding period, apparently carried the bottles to the south of Australia and New Zealand, current papers had arrived unusual fast on the Australian coasts, two and sometimes even three per day having come in, giving a total during the period in question of 124. As regards the currents in the sea east of Australia, these papers confirm the suggestion previously made by Mr. Russell, that there is first a drift to the east, especially south of Sydney, then northwards until the great current from the east passing south of New Caledonia is reached. This idea is supported also by the drift of the *Perthshire* after she was disabled in the Tasman sea. The steady eastward drift from the vicinity of Cape Horn across the Southern ocean is again exemplified by the track of three papers which, thrown overboard, one at that cape and two near the Falkland isles, were all picked up either on the west or south coasts of Australia. The current would seem to maintain a very uniform course slightly to the north of east. Bottles thrown overboard in the vicinity of Kerguelen and the Crozets were picked up on the coasts of New Zealand, and though the course followed could not be ascertained, the northward tendency of the current just mentioned would seem to favour the idea that they may have been carried round the great Australian bight before passing through Bass strait or south of Tasmania. The rate of drift seems to have been abnormally high during the period under review, particularly that northward along the east coast of Australia, which is accounted for by the prevalence of southerly winds during the winter and spring of 1899. The Cape Horn papers, however, show a similar abnormal rate, one showing an average per day of 12 miles. The papers were fairly evenly distributed through the year, the relatively small number received during April and September being perhaps accounted for by equinoctial disturbances. The record kept by six ships of the total number of bottles thrown out shows that the proportion of those picked up to the total varied from 1 in 7 to 1 in 48.

Lord Dunraven's 'Navigation.'*—There are already so many excellent works on Navigation, both from a theoretical and practical standpoint, that it may at first appear surprising that Lord Dunraven has thought it advisable to add to the number. Raper, Norie, Inman, and others give a vast amount of information on all matters connected with the subject, together with tables for the necessary computations, whilst Lecky's 'Wrinkles,' and books of a similar character, form most useful supplements to these for the practical man. Still, there is doubtless truth in Lord Dunraven's statement in his preface, that "most writers have treated the subject from the point of view of addressing themselves either to the highly educated or to the totally uneducated," and there is, he thinks, room for a treatise designed to meet the requirements of those who lie between these two extremes. This work does not, therefore, presuppose any great amount of mathematical knowledge on the part of the student, nor is it, on the other hand, written on the assumption that it is sufficient to give a number of rules to be learnt off by heart, without any appeal to the reasoning powers, which has too often been done in the past by writers on this and kindred subjects; but by a series of diagrams, lucid explanations and clearly expressed investigations of formulæ, Lord Dunraven has succeeded in producing a work that will not only be useful to those who are thinking of going up for the Board of Trade examinations, for whom it should possess a special value, but to all who are interested in practical astronomy and navigation. Unlike Raper,

* 'Self-instruction in the Practice and Theory of Navigation.' By the Earl of Dunraven, Extra Master. In two volumes. London: Macmillan & Co. 1900. Price 21s.

Norie, and others, Lord Dunraven does not give tables of logarithms, logarithmic sines, tangents, cosines, etc., and his work cannot therefore be considered as superseding the standard works on the subject, but should be looked upon rather as supplementing them. In the examples given, Norie's tables have been generally used, but for those who are accustomed to the tables in Raper or Inman, a comparative statement is given at the commencement of the first volume. In order to prevent the work from being inconveniently large, it is divided into two volumes. The first contains, amongst other matters, chapters on logarithms and their use, the sailings, a day's work, the use of the compass, charts, and the simpler nautical astronomical problems. The second volume treats of the more advanced astronomical problems, magnetism and deviation, great circle sailing, tides, the law of storms, and the investigation of the formulæ employed. It further contains numerous exercises, together with the data from the Nautical Almanac of 1898 necessary to work them. There will doubtless be found those who are not altogether prepared to agree with Lord Dunraven in all the opinions he expresses, and would recommend different methods of working some of the problems; or perhaps some would, in certain examples, prefer to use other tables than those here employed. It is possible, too, that occasionally somewhat better and clearer diagrams might have been chosen to represent the cases under consideration; but, taken as a whole, Lord Dunraven may be congratulated on having produced a very practical and serviceable work. There is a full table of contents, but no index, which is certainly to be regretted.

GENERAL.

Memento of Captain Cook's Death.—As announced by the President at the opening meeting of the session, an interesting photograph of the club by which Captain Cook met his death at the hands of the Hawaiian savages has been presented to the Society by the present owner of the club. It is accompanied by an autograph letter of Sir Joseph Banks, the former owner of the relic, to whom it was given by Admiral John Hunter, and who in turn presented it to Thomas Legh, of Lyme Park, Cheshire. The latter was a traveller of some note in his day, publishing in 1816 a narrative of his journey in Egypt and beyond the cataracts. He was one of the founders of the Raleigh Club, the direct precursor of the Royal Geographical Society, and, on the formation of the latter, was one of its original Fellows. The donor of the photograph and letter is his daughter and only child, Mrs. Ellen J. Lowther, of Shigley Hall, Cheshire.

CORRESPONDENCE.

The Aurora Australis and Borealis.

80, Crescent Road, Toronto, Canada, October 24, 1900.

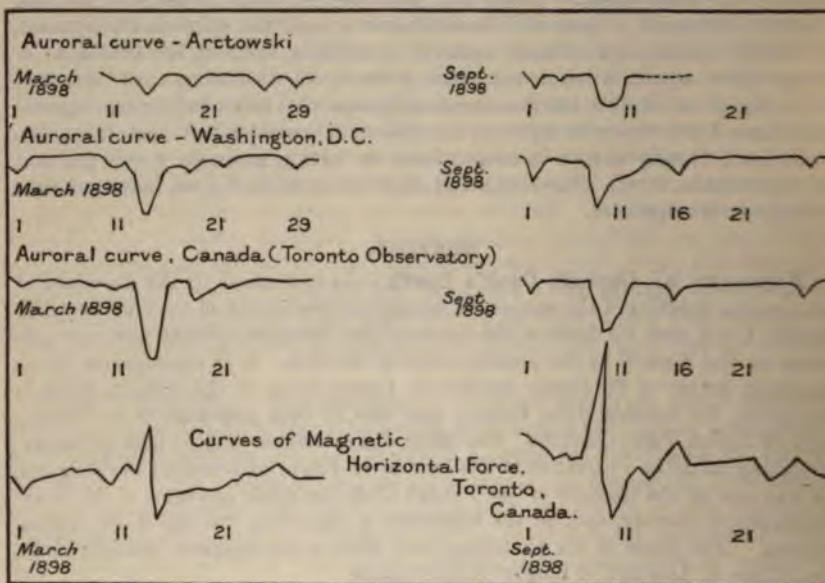
In the July number of the *Geographical Journal* I see recorded in a paper by Mr. Arctowski the observations on the auroræ australes made by the *Belgica* expedition in the antarctic. They possess special interest to me, for I have for years been wishing for just such observations. I send a paper of mine 'On the Magnetic Influence of the Sun on the Earth and on Comets,' and draw attention to a paragraph on p. 354, which shows the importance to be attached to auroral records in south polar regions.

Mr. Arctowski says it would be interesting to know if the northern auroræ correspond to the southern in general characteristics and in date, and invites investigations.

As to "characteristics," I may be permitted to say that the features of an auroral display are often so local that a concordance between those in both hemispheres is scarcely to be looked for. We may have a fine auroral arc here, and you may have only fine streamers in your hemisphere, or a rose aurora here with a crown, and you a pale lot of flashing merry-dancers. We may have a great magnetic disturbance, enough to work the telegraphic circuits by, along 10 or 15 degrees of longitude, but the aurora may be visible at one point only on the parallel. Therefore, I do not look for any similarity in the "characteristics" of an auroral display in the antarctic and the arctic regions, as noted in isolated localities.

But as for general excitement, I do expect a concordance, and Mr. Arctowski's reports enable this to be established for the season of 1898.

We have two sets of observations which we can compare with his. One is to be found in the Weather Reports of the United States Bureau. The number of



AURORAL CURVES IN THE ANTARCTIC AND IN CANADA.

auroræ seen by the correspondents of that Bureau is published every month. The other is in the *Weather Review*, published in Toronto, which gives not only the numbers of auroræ seen by observers, but also the class of aurora, called first, second, third, and fourth.

Now, in examining both of these records, I find, as expected, a remarkable concordance with Mr. Arctowski's figures. When I say "figures," I mean his observations as expressed in figures so as to make a curve of frequency and intensity.

The antarctic observations show a number of auroræ in March and in September, 1898, with but few in the intervening months. The same thing is noticeable both in the Washington and in the Toronto observations.

The intervening months show similar slight displays at identical times. And as to the two months mentioned, the data are enclosed in the form of curves, and will enable the reader to make the comparison, and establish the identity in times for himself.

I give to Mr. Arctowski's classes a numerical value for each. It may not be correct, for the relative value of each class may not be accurate, but it cannot be far wrong, and is sufficient for the purpose.

The Washington observations can only be classified in time, *i.e.* by the mere numbers of auroræ seen. The Toronto observations are turned into figures by taking an aurora of the first class as four, one of the second as three, of the third as two, and of the fourth as one.

It may be added that, by the records of the Toronto Magnetic Observatory, the months between March and September, 1898, were very quiet, but on the days of the auroræ in those two months there were severe magnetic storms. It seems certain that if there were a good magnetic observatory in the furthest south accessible, the disturbances would be found to correspond to the day, and possibly to the hour, with those in the northern hemisphere.

ARTHUR HARVEY, F.R.C.S.,

Ex-President of the Canadian Institute and of the Astronomical and Physical Society of Toronto.

Mr. Grogan's Picture of Mount Ruwenzori.

Holland House, New York City, November 11, 1900.

It has been brought to my notice that there is a marked resemblance between the picture of Mount Ruwenzori in my paper (*Geographical Journal*) for August, p. 179, and the photograph in Dr. Stuhlmann's book 'Mit Emin Pasha ins Herz von Africa.' My outline of the mountains was made from the high plateau behind Mboga, when I had a momentary glimpse of the summits through a break in the clouds. On looking through Stuhlmann's book, Mr. McCormick and I noticed that the points of view of Stuhlmann and myself were practically identical, and in the picture Mr. McCormick may have utilized Stuhlmann's photograph for subsidiary detail. This should undoubtedly have been acknowledged, and I trust that Dr. Stuhlmann will attribute the omission to my difficulty in writing and arranging for the publication of the paper and book at a distance from my publisher and artist, due to my having been tied to Gosport by my militia duties. A German critic labours under the delusion that the view of Ruwenzori was taken from the foot-hills of the mass. The view is from the other side of the Semliki valley, where the banana is found to a height of 7000 feet.

EDWARD S. GROGAN.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1900-1901.

First Ordinary Meeting, November 12, 1900.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Thomas Inglis Binnie, C.E. Surveyor B.C.A. Protectorate; Lieut. Philip Lansdale, East Lancashire Regiment; Frederick W. Mayers, Imperial Chinese Customs; Montagu Charles Summers.*

The Papers read were:—

"Opening Address." By the President. "An Expedition between Lake Rudolf and the Nile." By Dr. Donaldson Smith.

No. VI.—DECEMBER, 1900.]

GEOGRAPHICAL LITERATURE OF THE MONTH.

*Additions to the Library.*By HUGH ROBERT MILL, D.Sc., LL.D., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Abh. = Abhandlungen.	Mem. = Memoirs, Mémoires.
Ann. = Annals, Annales, Annalen.	Met. = Meteorological.
B. = Bulletin, Bollettino, Boletim.	P. = Proceedings.
Com. = Commerce.	R. = Royal.
C. Rd. = Comptes Rendus.	Rev. = Review, Revue.
Erdk. = Erdkunde.	S. = Society, Société, Selakab.
G. = Geography, Geographie, Geografia.	Sitzb. = Sitzungsbericht.
Ges. = Gesellschaft.	T. = Transactions.
I. = Institute, Institution.	V. = Verein.
Iz. = Izvestiya.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
k. u. k. = kaiserlich und königlich.	Z. = Zeitschrift.
M. = Mitteilungen.	Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. Penck.
Der Vernagtferner. Von A. Penck. (Separat-Abdruck aus dem Neuen Jahrbuch für Mineralogie, etc. 1898. Bd. ii.) Size 9 × 6, pp. [8]. *Presented by the Author.*

Alps. Penck.
Die vierte Eiszeit im Bereiche der Alpen. Vortrag, gehalten den 14 December 1898 von Albrecht Penck. (Vorträge des Vereines zur Verbreitung naturwissenschaftlicher Kenntnisse in Wien. XXXIX. Jahrg. Heft. 3.) Wien, 1899. Size 7½ × 4½, pp. 20. *Presented by the Author.*

Rumania. Liddell.
Trade of Roumania for the year 1899. Foreign Office, Annual No. 2486, 1900. Size 9½ × 6½, pp. 30. *Price 2d.*

Russia. B. Comité Géolog. St. Petersburg 18 (1899): 195-233. Ballore.
Description sismique de l'Empire Russe. Par F. de Montessus de Ballore. [In Russian, with *Résumé* in French.] *With Map.*

Russia—Lake Ladoga. C. Rd. 130 (1900): 1789-1793. Schokalsky.
Le lac Ladoga au point de vue thermique. Note de M. Jules de Schokalsky. *With Diagrams.*

See note in *Journal* for October, p. 471.

Scandinavia. Ahlenius.
Till kändedom om Skandnaviens geografi och Kartografi under 1500-talets senare hälft. Af K. Ahlenius. (Mit einem *Résumé* in deutscher Sprache.) Upsala (C. J. Lundström); Leipzig: Otto Harrassowitz, (1900). Size 9½ × 6, pp. 140. *Presented by the Author.*

This is a study of the knowledge possessed by the geographers of Europe in the latter half of the sixteenth century as derived from maps and books. It is supplementary to the author's earlier work on Olaus Magnus.

Scandinavia—Ice Age. J. Geology 8 (1900): 326-332. Reusch.
A note on the last stage of the Ice Age in Central Scandinavia. By Hans Reusch. *With Illustrations.*

Spain—Barcelona. Roberts.
Trade of Barcelona for the year 1899. Foreign Office, Annual No. 2460, 1900. Size 10 × 6½, pp. 38. *Price 2½d.*

- Spain—Bilbao.** Larrea.
Trade of Bilbao and District for the year 1899. Foreign Office, Annual No. 2445, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 32. Price 2d.
- Sweden.** Gavelin.
B. Geolog. I. University Upsala 4 (1899): 231-242.
On the glacial lakes in the upper part of the Ume river-valley. By Axel Gavelin. *With Map.*
- Sweden—Climate.** Egnel.
La G., B.S.G. Paris (1900): 199-208.
Le climat de la Suède et les causes des variations de climat, d'après M. Ekholm. Par M. Egnel. *With Maps.*
The maps embrace the whole of Northern Europe. The article is a summary of the memoirs published in *Ymer* during 1899.
- Sweden—Gothenburg.** Duff.
Trade of Gothenburg for the year 1899. Foreign Office, Annual No. 2490, 1900. Size $10 \times 6\frac{1}{2}$, pp. 34. Price 2½d.
- Switzerland.** Correvon.
Jahrb. Schweiz. Alpenclub 35 (1899-1900): 187-202.
La Vallée de Tourtemagne, en Valais. Par H. Correvon. *With Illustrations.*
- Switzerland.** Rosier.
Le Globe B.S.G. Genève 39 (1900): 109-112.
Le milieu géographique Suisse considéré comme facteur du développement historique. (*Résumé.*) Par M. W. Rosier.
- Turkey—Salonica.** Shipley.
Trade of Salonica and District for the year 1899. Foreign Office, Annual No. 2468, 1900. Size 10×6 , pp. 36. Price 2½d.
- United Kingdom—England.** Barnes and Holroyd.
Mém. S. Spéléologie No. 23 (1900): pp. 19.
La Blue-John-Mine à Castleton (Angleterre). Par MM. Barnes et Holroyd. *With Plans.*
- United Kingdom—England.** Bosworth.
Philips' County Readers. Kent, Past and Present. By George F. Bosworth. London: G. Philip & Son, 1901 [1900]. Size $7\frac{1}{2} \times 5$, pp. x. and 268. *Maps and Illustrations.* Price 2s. *Presented by the Publishers.*
An excellent history of Kent adapted for use as a "reader" in the schools of that county. The geographical sections are subordinated to the historical.
- United Kingdom—Ireland.** Johnson.
Economic P.R. Dublin S. 1 (1899): 1-72.
The Irish Peat Question. By T. Johnson, D.Sc. *With Illustrations.*
- United Kingdom—Orkneys.** Flett.
T.R.S. Edinburgh 39 (1897-98): 383-424.
The Old Red Sandstone of the Orkneys. By John S. Flett, M.B., etc. *With Map.*
- United Kingdom—Scotland.** Buchanan.
T.R.S. Edinburgh 39 (1898-99): 779-826.
The Meteorology of Ben Nevis in Clear and in Foggy Weather. By J. Y. Buchanan. *With Diagrams.*
- United Kingdom—Rainfall.** Wallis.
British Rainfall, 1899. On the distribution of Rain over the British Isles during the year 1899, as observed at about 3500 Stations in Great Britain and Ireland, with articles upon various branches of Rainfall work. Compiled by H. Sowerby Wallis. London: E. Stanford, 1900. Size $9 \times 5\frac{1}{2}$, pp. 56 and 252. *Portrait, Charts, and Diagram.* Price 10s. *Presented by the Compiler.*
This volume is accompanied by a sketch of the career and an admirable portrait of Mr. G. J. Symons, the founder of the British Rainfall Organization. The work is one of national importance, although entirely organized by a private individual and carried out by the co-operation of a staff of volunteer unpaid workers, the magnitude of which is unexampled in modern scientific enterprise.
- United Kingdom—Tide Tables.** Harris and Havergal.
Tide Tables for the British and Irish Ports for the year 1901: also the times and heights of High Water at full and change for the principal places of the Globe. By Captain H. R. Harris and Commander A. Havergal. London: J. D. Potter, [1900]. Size $10 \times 6\frac{1}{2}$, pp. xl. and 262. Price 2s. *Presented by the Hydrographer, Admiralty.*

ASIA.

Central Asia.

Demidoff.

After Wild Sheep in the Altai and Mongolia. By E. Demidoff. London: Rowland Ward, Limited, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. xii. and 324. *Map and Illustrations.* Price 21s. net. Presented by the Publishers.

Prince Demidoff and his wife, together with Mr. and Mrs. Littledale, made the journey which he describes in this volume during 1897. From Barnaul on the Ob the route led south-eastward to the sources of the Chuya river, and thence into Mongolia, up the Kobdo river almost to its source, and then along the northern slope of the Altai mountains. The book is excellently illustrated, and has a clear map.

Central Asia.

Hedin.

Die geographisch-wissenschaftlichen Ergebnisse meiner Reisen in Zentralasien, 1894-1897. Von Dr. Sven Hedin (Dr. A. Petermanns Mitteilungen. Ergänzungsheft Nr. 131). Gotha: Justus Perthes, 1900. Size $11 \times 7\frac{1}{2}$, pp. 400. *Maps.* Price 20 mark.

The complete scientific geographical results of Dr. Sven Hedin's three years' work in Central Asia (1894-97).

Ceylon.

Leclercq.

Un séjour dans l'Ile de Ceylan. Par Jules Leclercq. Paris: Plon-Nourrit et Cie, 1900. Size $7\frac{1}{2} \times 5$, pp. 294. *Map and Illustrations.* Price 4 fr. Presented by the Author.

M. Leclercq visited Ceylon after having seen Java, in the hope that he might decide to which island belonged the distinction of being the earthly paradise, but after having tried both he is unable to pronounce for one or the other, so evenly balanced did he find their diverse excellences.

China.

Walton.

China and the Present Crisis, with Notes on a Visit to Japan and Korea. By Joseph Walton, M.P. London: Low & Co., 1900. Size 8×5 , pp. xii. and 320. *Map.* Price 6s. Presented by the Publishers.

The record of the travels, experiences, and opinions of a Member of Parliament after a tour of eight months' duration in China, and a brief visit to Japan and Korea.

India.

Hunter.

A History of British India. By Sir William Wilson Hunter, K.C.S.I., etc., volume ii. To the Union of the old and new Companies under the Earl of Godolphin's Award. London: Longmans & Co., 1900. Size $9\frac{1}{2} \times 6$, pp. 420. Price 16s. Presented by Lady Hunter.

This volume carries on the history of English enterprise in India from 1623 to 1708. The final chapter (1698-1708) had not been written at the time of the author's death, but is supplied following the indications of his notes by P. E. Roberts, who also contributes an introduction to the book.

India.

Sewell.

A Forgotten Empire (Vijayanagar). A contribution to the History of India. By Robert Sewell. London: Sonnenschein & Co., 1900. Size $10\frac{1}{2} \times 6\frac{1}{2}$, pp. xxii. and 428. *Maps and Illustrations.* Price 15s. Presented by the Author.

The history of the old kingdom which occupied the south of the Indian peninsula, and of the rise and fall of Portuguese power in India. An important part of the work is the translation for the first time of two important Portuguese documents, by Domingo Paes about 1520 and Fernão Nuniz about 1535. There are several maps and numerous photographs of ruins dating from the period of prosperity.

India—Burma.

Sherriff.

Railway Communication with China. By William Sherriff. The Burmah-China Railway. [Reprinted from the *Manchester Guardian* of March 9, 1900.] Size $8\frac{1}{2} \times 6\frac{1}{2}$, pp. 4. Presented by the Author.

India—Burma.

Tables for the Transliteration of Shan Names into English. Rangoon, 1900. Size 10×7 , pp. 14. Presented by the Government of Burma.

India—Earthquake. Mem. Geolog. Surv. India 29 (1899): 380.

Oldham.

Report on the Great Earthquake of June 12, 1897. By R. D. Oldham. With Maps and Illustrations.

This is an exhaustive report on the last great Indian earthquake, which is considered in all its aspects. The main memoir is supplemented by numerous special reports made by members of the Geological Survey deputed to investigate the phenomena in

special districts. The whole is richly illustrated by photographs, diagrams, and seismograph tracings.

India—Irrigation. *J.S. Arts* 48 (1900): 831-837. **Cotton.**

Irrigation in India.

A supplement to an article by General F. C. Cotton in *Blackwood's Magazine* for May, 1900.

India—Kashmir. *Globus* 78 (1900): 222-226. **Francke.**

Eine Besteigung des Karsongpasses (Kaschmir). Von Hermann Francke. *With Illustrations.* Also a separate copy, presented by Herr G. Th. Reichelt.

A summer trip from Leh to the summit of the Karsong pass.

India—North-West Frontier. **Walters.**

The operations of the Malakand Field Force and the Buner Field Force, 1897-98. Compiled in the Intelligence Branch . . . by Captain H. F. Walters. Simla, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. iv., 90, and 86. *Maps and Plates.* Presented by the Intelligence Branch, Simla.

India—Sikhim Himalayas. **Donaldson.**

Lepcha Land, or Six Weeks in the Sikhim Himalayas. By Florence Donaldson. London: Low & Co., 1900. Size 9×6 , pp. xii. and 214. *Map and Illustrations.* Price 10s. 6d. net. Presented by the Publishers.

An excellent account of a six-weeks' journey in one of the least-known parts of the Indian frontier. The photographs are unusually well chosen and illustrative.

Japan—Hakodate. **Chalmers.**

Trade of Hakodate for the year 1899. Foreign Office, Annual No. 2503, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 12. Price 1d.

Korea. *Rev Française* 25 (1900): 394-398. **Fauvel.**

Corée: Le port de Ma-San-Pho. Par M. A. A. Fauvel. *With Map.*

The position of this port, opened by Korea to foreign trade in 1899, was so little known that it is given erroneously in the supplement to Vivien de St. Martin's Gazetteer.

Malay Archipelago. *Nature* 62 (1900): 327-328.

The Cruise and Deep-Sea Exploration of the *Siboga* in the Indian Archipelago. *With Charts.*

Malay Archipelago—Amboina. **Vries.**

Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 467-502, 593-621.

Reis door eenige eilandengroepen der Residentie Amboina. Door J. H. de Vries.

Malay Archipelago—Borneo. *Oester. Monats. Orient* 26 (1900): 76-79. **Breitenstein.**

Die Handelsverhältnisse auf Borneo und in Niederländisch-Indien. Von Dr. Heinrich Breitenstein.

Malay Archipelago—Borneo. **Keyser.**

Trade of Brunei and Sarawak for the Year 1899. Foreign Office, Annual No. 2491, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 12. Price 1d.

Malay Archipelago—Borneo and Java. **Breitenstein.**

21 Jahre in Indien. Aus dem Tagebuche eines Militärarztes. Erster Theil: Borneo. Zweiter Theil: Java. Von Dr. H. Breitenstein. Leipzig: Th. Grieben's Verlag (L. Fernau), 1899-1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. (Theil i.) 264; (Theil ii.) xii. and 408. *Illustrations.* Price 12s.

The experiences and observations of an army surgeon who for twenty-one years was in the service of the Netherlands Government in Borneo and Java. The notes on the people and on the conditions as to health are of interest.

Malay Archipelago—Java. **Van der Stok.**

Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 585-592.

Een nieuwe regenkaart van Java. Door Dr. J. P. Van der Stok. *With Map.*

A new rainfall map of Java on the scale of 1: 1,500,000. The distribution of rainfall is, as a rule, greatest on the watersheds between adjoining river-basins, but there are some curious anomalies, especially in the western half of the island.

Malay Archipelago—Sumatra. **Heldring.**

Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 622-639.

Poeloe Weh; zijne topographische beschrijving en eenige opmerkingen met betrekking tot de beteekenis van het eiland. Door E. Heldring. *With Map.*

Description of the small island off the northern extremity of Sumatra at entrance to the Strait of Malacca.

Philippine Islands—Diseases.

Flexner and Ba

Johns Hopkins University Circulars 19 (1900): 13-16.

Report of a Special Commission sent to the Philippines by the Johns Hopkins University to investigate the prevalent diseases of the Islands. By Prof. Flexner, M.D., and Prof. L. F. Barker, M.D.

Russia—Siberia.

Petermanns M. 46 (1900): 161-165.

Di

Die geologischen Ergebnisse der Reisen von Baron E. Toll entlang der nördlichen sibirischen Eismeerküste und nach den Neusibirischen Inseln. Von Prof. Dr. Diener. *With Map.*

Russian.

La G., B.S.G. Paris (1900): 81-100.

Saint-

Notes sur la distribution des plantes en Sibirie et dans l'Asie centrale. Par M. Saint-Yves. *With Illustrations.*

The author, in discussing the vegetation of Northern and Central Asia, points out the close relation of the botanical and physical conditions of the continent, and influences which the vegetation exercises on the mode of life of the people.

Siam—Malay States.

Scottish G. Mag. 16 (1900): 505-523.

Annan

The Siamese Malay States. By Nelson Annandale. *With Illustrations.*

Mr. Annandale was junior zoologist on Mr. W. W. Skeat's expedition to the Malay peninsula, and he gives here a narrative of the expedition and a sketch of his impressions of Siam and the Siamese.

Turkey—Baghdad.

Me

Trade of Baghdad for the year 1899. Foreign Office, Annual No. 2459, 1900. Size 10 × 6, pp. 8. Price ½d.

Turkey—Erzerum.

L

Trade of Erzerum for the year 1899. Foreign Office, Annual No. 2477, 1900. Size 10 × 6, pp. 10. Price 1d.

Turkey—Palestine.

Wi

Palestine Exploration Fund, Quarterly Statement (1900): 365-369.

The Dead Sea. By Major-General Sir Charles Wilson, K.C.B.

Sir Charles Wilson is not inclined to agree with Mr. Gray Hill's suggestion in *Journal* for November, p. 555 that the bed of the Dead sea is being raised by volcanic agency. He shows that all the variations of level may be explained by the fluctuations of the rainfall.

Turkey—Palestine.

Bo

Days in Galilee and Scenes in Judæa, together with some account of a solitary cycling journey in Southern Palestine. By the Rev. Alexander A. Bodd. London: Gay & Bird, 1900. Size 9 × 6, pp. xxii. and 354. *Illustrations.* Price 7s. 6d. *Presented by the Author.*

The author, in apologizing for the predominance of the human element in part of his narrative, remarks that he "finds it very difficult to keep the natural man in place for long, even when in the Holy Land." Despite the somewhat deprecating preface, this volume in no way falls short of the others from Mr. Boddy's pen.

Turkey—Smyrna.

Cumberb

Trade of Smyrna and District for the years 1897-99. Foreign Office, Annual No. 2462, 1900. Size 10 × 6½, pp. 58. *Plan.* Price 6d.

Western Asia—Ararat.

Jahrb. Schweiz. Alpenclub 35 (1899-1900): 157-183.

Osw

Eine Besteigung des Ararat. Von Dr. Ad. Oswald. *With Illustrations.*

The ascent of Ararat here described was made in October, 1897.

Western and Central Asia.

J. Bombay Br. R. Asiatic S. 20 (1899): 156-190.

M

The Cities of Iran as described in the old Palahavi treatise of Shatrôihai-i-Irân. By Jivanji Jamshedji Modi.

AFRICA.

Abyssinia.

Wel

King Menelek's Dominions and the Country between Lake Gallop (Rudolf) and the Nile Valley. By the late Captain M. S. Wellby. (From the *Geographical Journal* for September, 1900.) Size 10 × 6½, pp. 16. *Map.*

Africa—Travel.**Grogan.**

Through Africa from the Cape to Cairo. By Ewart S. Grogan. (From the *Geographical Journal* for August, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 22. *Map and Illustrations.*

Africa—Travel.**Grogan and Sharp.**

From the Cape to Cairo, the First Traverse of Africa from South to North. By Ewart S. Grogan and Arthur H. Sharp. London: Hurst & Blackett, 1900. Size $10 \times 7\frac{1}{2}$, pp. xvi. and 378. *Portrait, Maps, and Illustrations.* Price 21s. net. *Presented by the Publishers.*

A handsome volume, illustrated by drawings largely from the authors' photographs, and descriptive of the adventurous journey the geographical facts of which have been laid before the Society by Mr. Grogan, and published in the *Journal* for August, ante, p. 164.

Algeria.**Wilkin.**

Among the Berbers of Algeria. By Anthony Wilkin. London: T. Fisher Unwin, 1900. Size 9×6 , pp. xiv. and 264. *Sketch-map and Illustrations.* Price 16s. *Presented by the Publisher.*

Records of an interesting journey, including visits to some of the mountainous and desert parts of Algeria not often visited by British travellers. The photographs are numerous, the subjects well chosen, they are admirably printed, and a fair proportion are good. The spelling of the place-names is French, with, however, a substitution of *w* for the consonantal *ou*, so that some of them will be difficult to trace on either French or English maps.

British East Africa—Zanzibar.**Cornish.**

Trade of Zanzibar for the year 1899. Foreign Office, Annual No. 2520, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 14. Price 1d.

Comoro Group.**Vienne.**

Notice sur Mayotte et les Comores. Par Emile Vienne. (Exposition Universelle, 1900.) Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 200. *Illustrations.* *Presented by M. Charles Roux.*

So little has been written about the rarely visited islands of Mayotte and Comoro that this volume is relatively of greater importance than most of the other Exhibition memoirs of the French colonies.

Congo State.*Globus* 78 (1900): 93-96.

Die Entwicklung von Léopoldville am Stanley Pool. *With Illustration.*

A picture of the harbour at Leopoldville is given in this description of the growth of the great centre of river-trade on the Congo system.

Dahomey.**Fonssagrives.**

Notice sur le Dahomey, publiée à l'occasion de l'Exposition Universelle. . . . Par M. Jean Fonssagrives. [1900.] Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 408. *Map and Illustrations.* *Presented by M. Charles Roux.*

Egypt.**Kemeid.**

Cairo and Egypt and Life in the Land of the Pharaohs, being a Pictorial and Descriptive Guide to Cairo and the Nile. By Hallil J. Kemeid. Fourth Yearly Edition (Revised). London: Simpkin, Marshall, & Co., 1900. Size $7\frac{1}{2} \times 5$, pp. 196. *Illustrations.* Price 1s. *Presented by the Publishers.*

Egypt—Port Said and Suez.**Cameron.**

Trade of Port Said and Suez for the year 1899. Foreign Office, Annual No. 2509, 1900. Size $10 \times 6\frac{1}{2}$, pp. 12. Price 1d.

Portuguese West Africa.**Sanders.**

Determination of the latitude of Ambriz and of San Salvador (Portuguese West-Africa). By C. Sanders. (K. Akad. van Wetenschappen te Amsterdam.) Reprinted from Proceedings of the Meeting of Saturday, January 27, 1900 (February 21, 1900). Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. 10. *Presented by the Author.*

The author, as the mean of numerous observations, has fixed the latitude of the harbour light at Port Ambriz as $7^{\circ} 49' 48''$ S., instead of $7^{\circ} 52' 9''$ as given in the Admiralty chart; and for San Salvador do Congo he found $6^{\circ} 15' 16''$, instead of the previously accepted value, $6^{\circ} 20' 10''$.

Portuguese West Africa—Angola.**Hauser.**

Questions Dipl. et Colon. 10 (1900): 449-462.

Études sur les colonies portugaises. II. Angola. Par le Professeur Henri Hauser. *With Map.*

Réunion.

Garsault

Exposition Universelle de 1900. Colonies Françaises. Notice sur la Réunion rédigée sous la direction de M. A.-G. Garsault. Paris: J. André, 1900. Size $9\frac{1}{2} \times 6$, pp. 308. *Map and Illustrations. Presented by M. Charles Roux.*

Rhodesia.

The British South Africa Company. Information as to Mining in Rhodesia, supplied to the British South Africa Company. 1900. Size $10\frac{1}{2} \times 8\frac{1}{2}$, pp. 412. *Maps. Presented by the British South Africa Company.*

Reports of the work done by the numerous minor companies engaged in developing the resources of Rhodesia. The output of gold for the first six months of 1900 averaged over 5500 ozs. per month.

Sahara.

Rev. Française 25 (1900): 415-420.

Vasco.

Sahara: Le mission Foureau-Lamy. Par M. G. Vasco.

See also an account of this journey with illustrations in *A travers le Monde, Tour du Monde* 6 (1900), pp. 293-294.

Somaliland.

Swayne.

Seventeen Trips through Somaliland and a Visit to Abyssinia. A Record of Exploration and Big Game Shooting, with descriptive notes on the Fauna of the Country. By Major H. G. C. Swayne. Second Edition. London: Rowland Ward, Limited, 1900. Size 8×5 , pp. xxii. and 386. *Maps and Illustrations. Price 7s. 6d. net. Presented by the Publisher.*

A new edition of a well-known work of permanent interest.

Somaliland.

J. Manchester G.S. 16 (1900): 1-30.

Kœttilitz.

A Journey through Somaliland and Southern Abyssinia to the Shangalla or Berta Country and the Blue Nile, and through the Sudan to Egypt. By Dr. Reginald Kœttilitz. *With Illustrations.*

South Africa.

Colquhoun.

The Renaissance of South Africa. By Archibald R. Colquhoun. London: Hurst & Blackett, 1900. Size $8 \times 5\frac{1}{2}$, pp. viii. and 300. *Map. Price 6s. Presented by the Publishers.*

Six chapters deal with "The Land," "The People," "History," "The New Lands of Promise and Disappointment" (under which heading the author considers Mashonaland, Matabililand, British Central and East Africa), "The Economic Future," and "The Settlement." The author explains his object as being "to gather together and present in the simplest form the salient facts in the story of South Africa, and the principal features in the problem of settlement with which, as a nation, we are face to face."

South Africa—Boers.

Leclercq.

Les Boers et leur état social. Par M. Jules Leclercq. (From 'La Reform Sociale, Bulletin de la Société d'Economie Sociale et des Unions de la Paix Sociale,' No. 931" Janvier 1900, pp. 70-82.) Paris, 1900. Size $10 \times 6\frac{1}{2}$. *Presented by the Author.*

Transvaal and Swazieland. P.R. Dublin S. 9 (1899): 12-21.

Lyburn

Mining and Minerals in the Transvaal and Swazieland. By E. St. John Lyburn. *With Plate.*

Tripoli—Bengazi.

Alvarez

Trade of Bengazi for the year 1899. Foreign Office, Annual No. 2456, 1900. Size 10×6 , pp. 16. *Price 1d.*

Tunis.

Deutsche Rundschau G. 22 (1900): 409-413, 486-491.

Levy.

Die Grundlagen des französischen Protectorates in Tunesien. (Verwaltung, Justiz, Oeffentlicher Unterricht, Heerwesen.) Von Victor Levy. *With Illustrations.*

Tunis—Bizerta. Rev. Maritime 144 (1900): 473-508; 145 (1900): 50-79.

Castaing.

Bizerte: Les souvenirs du passé. Par R. Castaing. *With Maps.*

This treatise traces the history of Bizerta from the Palæolithic period through the historic ages down to the present time.

West Africa.

Questions Dipl. et Colon. 10 (1900): 412-423. Hostains and d'Ollone.

La Mission Hostains-d'Ollone. *With Map.*

NORTH AMERICA.

Alaska.

Eighth Annual Report of the Introduction of Domestic Reindeer into Alaska.—Annual Reports of the Department of the Interior, 1898. Report of the Commissioner of Education. Vol. ii. pp. 1773-1796. Washington, 1899.

Alaska.

Brady.

Report of the Governor of Alaska.—Annual Reports of the Department of the Interior, 1898. Miscellaneous Reports. Pp. 181-227. *Plan*. Washington, 1898.

A frank statement of the condition of administration and economic development in Alaska.

Mexico and Guatemala.

Seler.

Auf alten Wegen in Mexiko und Guatemala. Reiseerinnerungen und Eindrücke aus den Jahren 1895-1897. Von Cæcilie Seler. Berlin: Dietrich Reimer (Ernst Vohsen), 1900. Size 10×7 , pp. xxiv. and 364. *Map and Illustrations*. Price 20 mark. *Presented by the Publisher*.

The record of a journey, "not to find novelties but to seek antiquities," in Central Mexico and Western Guatemala. The book is very richly illustrated, a number of hieroglyphic figures are even reproduced in colour in the text. There is a large-scale map of the route and many sketch-maps of particular localities.

St. Pierre and Miquelon.

Caperon.

Les Colonies Françaises. Saint-Pierre et Miquelon. Par M. Maurice Caperon. Paris, 1900. Size 9×6 , pp. 32. *Map and Illustrations*. *Presented by M. Charles Roux*.

United States.

G.Z. 6 (1900): 417-434.

Deckert.

Die Nordamerikanische Union als Weltmacht. (Ein Vortrag.) Von Dr. Emil Deckert.

On the United States as an expanding power.

United States.

Gardini.

In der Sternenbanner-Republik. Reiseerinnerungen von Dr. Carlo Gardini. Nach der zweiten Auflage des italienischen Originals von M. Rumbauer. Oldenburg and Leipzig: A. Schwartz, [1900]. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. xvi. and 406. *Map and Illustrations*. *Presented by the Publisher*.

The translation of this excellent Italian work into German is justified, says the translator, because no books on travel in the United States have appeared in Germany for a long time. The book is in the form of a narrative of an extensive tour, with occasional appropriate digressions on the institutions and peculiarities of the country.

United States—Indians.

Grinnell.

The North American Indians of To-day. By George Bird Grinnell, F.R.S. London: C. Arthur Pearson, 1900. Size $12\frac{1}{2} \times 9$, pp. 186. *Illustrations*. Price 21s. net. *Presented by the Publisher*.

On the present number and condition of the Red Indians in the United States. The book is illustrated by fifty-five splendid portraits of Indian chiefs, belonging to twenty-six tribes, in native dress.

CENTRAL AND SOUTH AMERICA.

Andes.

Burckhardt.

Anales del Museo de la Plata. Sección Geológica y Mineralógica. II.—Profils géologiques transversaux de la Cordillere Argentino-Chilienne, stratigraphie et tectonique. Par le Dr. Carl Burckhardt. Première Partie du Rapport définitif sur une Expédition géologique effectuée par Dr. Leo Wehrli et Dr. Carl Burckhardt. La Plata, 1900. Size 15×11 , pp. viii. and 136. *Plates*. *Presented by the Museo de La Plata*.

This important work gives, in French, the full report of the researches carried on in 1897 by Drs. Burckhardt and Wehrli in the Argentino-Chilian Andes. It is richly provided with maps, sections, diagrams, and photographs.

Argentine-Chilian Boundary.

Argentine-Chilian Boundary. Report presented to the Tribunal appointed by Her Britannic Majesty's Government "To consider and report upon the Differences which have arisen with regard to the Frontier between the Argentine and Chilian

Republics," to justify the Argentine Claims for the Boundary in the Summit of the Cordillera de los Andes, according to the Treaties of 1881 and 1893. [4 vols. London: Printed for the Government of the Argentine Republic by W. Clowes & Sons, Limited, 1900. Size $13\frac{1}{2} \times 10\frac{1}{2}$, pp. xviii. and 1182. *Maps and Illustrations. Presented by the Argentine Government.*

These massive volumes contain a complete statement of the evidence for Argentine case as to the boundary with Chile in Patagonia, including a collection remarkably fine photographs and numerous maps.

Argentine Republic.

Annuaire Statistique de la Ville de Buenos-Ayres. IX^{me} Année, 1899. Buenos Ayres, 1900. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. xxxii. and 330. *Plan.*

Argentine Republic. *B.I.G. Argentino* 20 (1899): 483-496.

Chanour

Las Inundaciones en el Rio Negro. Medios de remediarlas. Por Enrique Chanourdie. *With Illustrations.*

Argentine Republic. *B.I.G. Argentino* 20 (1899): 475-482.

Cib

Ferrocarriles proyectados en el Neuquen. Por F. R. Cibils. *With Map.*

Argentine Republic. *B.I.G. Argentino* 20 (1899): 317-341.

Vall

Departamento Chamental (Prov. de la Rioja). Por G. Vallejo.

Barbados.

Willia

Barbados. Report for 1899. Colonial Reports, Annual No. 294, 1900. Size 10×6 , pp. 34. *Price 2½d.*

British Guiana.

Ki

British Guiana. Reports for 1897-98 and 1898-99. Colonial Reports, Annual No. 290, 1900. Size 10×6 , pp. 56. *Price 3d.*

Chile.

Daraps

Das Departement Taltal (Chile). Seine Bodenbildung und Schätze. Von I. Darapsky. Text and Maps. Berlin: Dietrich Reimer (Ernst Vohsen), 1900. Size $10\frac{1}{2} \times 7$, pp. x. and 230. *Illustrations. Price 30 m. Presented by the Publisher.*

A full and careful account, with numerous detailed maps and illustrations, of nitrate-yielding province of Taltal, in the north of Chile.

Porto Rico.

Churchwa

Trade of Porto Rico for the year 1899. Foreign Office, Annual No. 2465, 1900. Size $10 \times 6\frac{1}{2}$, pp. 24. *Price 1½d.*

Tobago

Imperial Department of Agriculture for the West Indies. Hints and Suggestions on Planting in Tobago. Issued by the Commissioner of Agriculture, 1900 (Pamphlet Series, No. 2.) Size 7×5 , pp. 20. *Presented by the Commissioner Imperial Department of Agriculture for the West Indies.*

Trinidad.

Evers

The Trinidad Reviewer for the year 1900. Compiled by T. Fitz-Evan Eversley. London: The Robinson Printing Co. Size 9×6 , pp. 568. *Map, Plans, and Illustrations. Price 3s. Presented by the Publishers.*

This gives an account of the history of Trinidad, with full details of the present condition of the colony, brief biographies of the colonial officials, a directory of island, and masses of other information, all practical and well arranged.

Venezuela—Caracas.

And

Trade of Caracas and District for the year 1899. Foreign Office, Annual No. 2466, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 24. *Price 1½d.*

West Indies.

Millspar

Plantæ Utowanæ. Plants collected in Bermuda, Porto Rico, St. Thomas, Cuba, Santo Domingo, Jamaica, Cuba, the Caymans, Cozumel, Yucatan, and the Alacran Shoals. Dec. 1898 to Mar. 1899. The Antillean Cruise of the yacht *Utoana*. Mr. Allison V. Armour, Owner and Master. By C. F. Millspaugh, M.D. Part i.—Catalogue of the Species. (Field Columbian Museum. Publication 4. Botanical Series, vol. ii. No. 1.) Chicago, 1900. Size $10 \times 6\frac{1}{2}$, pp. 110. *Map.*

Botanical collections made on a yachting trip through the West Indies.

AUSTRALASIA AND PACIFIC ISLANDS.

British New Guinea.

Winter.

British New Guinea. Report for 1898-99. Colonial Reports, Annual No. 292, 1900. Size 10×6 , pp. 56. Price 3d.

Cook Islands.

Gudgeon.

Cook Islands. Report for 1899. Colonial Reports, Miscellaneous, No. 13, 1900. Size $10 \times 6\frac{1}{2}$, pp. 16. Price 1d.

French Pacific Islands.

Lemasson.

Notice sur les Etablissements Français de l'Océanie. (Exposition Universelle de 1900.) Size $9\frac{1}{4} \times 6\frac{1}{2}$, pp. 128. Map and Illustrations. Presented by M. Charles Rouz.

This report passes in review all the Polynesian islands now under the French flag and gives statistics regarding them.

Melanesia.

Globus 78 (1900): 69-78.

Luschan.

R. Parkinsons Beobachtungen auf Bóbolo und Hün (Matty und Durour). Von Felix v. Luschan. With Illustrations.

These islands lying north of New Guinea in 2° S. and 143° E. are practically unvisited, and the observations of the people and their weapons here given is therefore of special interest.

POLAR REGIONS.

Antarctic—Belgian Expedition.

Cook.

Through the First Antarctic Night, 1898-1899. A Narrative of the Voyage of the *Belgica* among Newly Discovered Lands and over an Unknown Sea about the South Pole. By Frederick A. Cook, M.D. With an Appendix containing a summary of the Scientific Results. London: W. Heinemann, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. xxiv. and 478. Maps and Illustrations. Price 20s. net. Presented by the Publisher.

This is the first account of the voyage of the *Belgica* published in book form. It gives a full description of the dreariness of the long drift in the antarctic pack, and makes clear several defects in the equipment of the expedition, which, however, notwithstanding exceptional drawbacks, did admirable scientific work. Dr. Cook's photographs and coloured illustrations are in every way admirable.

Arctic—Abruzzi Expedition. National G. Mag. 11 (1900): 411-413.

Nansen's 'Farthest North' Eclipsed. With Portraits.

With portraits of the Duke of the Abruzzi and Captain Cagni.

Arctic—Abruzzi Expedition. B.S.G. Italiana 1 (1900): 956-961.

Faustini.

Il ritorno della Spedizione polare di S.A.R. il Duca degli Abruzzi.

MATHEMATICAL GEOGRAPHY.

Astronomy.

Indian Antiquary 29 (1900): 189-190.

Jacobi.

How to calculate the lagna. By Prof. Hermann Jacobi.

The term *lagna* means the point of the ecliptic upon the eastern horizon at a given time.

Cartography—Reliefs. Mém. S.G. Genève 39 (1900): 1-10.

Claparède.

Les Reliefs Perron. Par Arthur de Claparède.

On the qualities desirable in relief models with special reference to M. Perron's great relief of Switzerland on the scale of 1 : 100,000.

Cartography—Reliefs.

Perron.

Les Reliefs en général et du Relief au 1 : 100,000 de la Suisse en particulier. Par C. Perron. Genève: Librairie Stapelmohr, 1900. Size $8 \times 5\frac{1}{2}$, pp. 12. Presented by the Author.

On the principles of constructing reliefs on a true scale, and a short account of the new relief of Switzerland on the scale of 1 : 100,000. In this the heights are shown without exaggeration, and the whole is modelled to the true curvature of the Earth.

Navigation.

Dunraven.

Self-Instruction in the Practice and Theory of Navigation. By the Earl of Dunraven. 2 vols. London: Macmillan & Co., 1900. Size 9×6 , pp. (vol. i.) xxvi. and 354; (vol. ii.) x. and 390. Diagrams. Price 21s. net. Presented by the Author.

These volumes contain a statement of the methods of practical and theoretical navigation arranged for the use of students for the Board of Trade certificates, with special reference to the needs of the yachtman who is desirous of proving himself capable of commanding his own vessel. A special note is given, *ante*, p. 690.

Surveying.

Methods of Survey employed by the Chilean Boundary Commissions in the Cordillera of the Andes. By Prof. A. Bertrand. (From the *Geographical Journal* for September, 1900.) Size $10\frac{1}{2} \times 6\frac{1}{2}$, pp. 16. Bertrand

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Coast Forms.

J. Geology 8 (1900): 481-484.

Branner

The Origin of Beach Cusps. By J. C. Branner. With diagrams. Also a separate copy. Presented by the Author.

The author comes to the conclusion that beach cusps are produced by the interference of two sets of waves of translation on the beach.

Geomorphology.

Fleuves sous-marins. Épanchements d'eaux douces au-dessous du niveau de la mer. Par Henry Benest. Extrait du *R. Geographical Journal*, du mois d'octobre 1899 (Université Nouvelle, Institut Géographique de Bruxelles. Publication No. 3, Bruxelles, 1900. Size $10 \times 6\frac{1}{2}$, pp. 32. Charts. Benest

Geomorphology.

Eduard Brückner, Die feste Erdrinde und ihre Formen. Ein Abriss der allgemeinen Geologie und der Morphologie der Erdoberfläche. Von Albrecht Penck (Separatdruck aus der "Zeitschr. f. d. österr. Gymn." 1899.) Heft 3. Size 9×6 , pp. 6. Presented by Dr. A. Penck. Penck

A review of Prof. Brückner's book.

Oceanography—Arctic Ocean.

Mém. S. Imp. Russe G. (G. Gen.) 34 (1900): 1-136.

Andréeff

Océan Arctique. Matériaux océanographiques rassemblés pendant les années 1889-1893. Par M. N. Andréeff. [In Russian.] With Map.

Oceanography—Atlantic. *P.R.S. Edinburgh* 22 (1897-99): 403-429.

Peake

On the Survey by the s.s. *Britannia* of the Cable Route between Bermuda, Turk's Islands, and Jamaica. By R. E. Peake. With Descriptions by Sir John Murray, K.C.B., F.R.S., of the Marine Deposits brought Home. With Map.

The map shows the marine deposits between the parallels of Bermuda and Barbados and is bounded by the meridians of 60° and 85° W.

Oceanography—Mediterranean. *B.S.G. Italiana* 1 (1900): 699-717, 757-776.

Bertacchi

L'Italia e il suo Mare. Come e quanto l'Italia possa aver contribuito alla conoscenza Scientifica del Mediterraneo. Memoria del Cosimo Bertacchi.

On the work done by Italians in the study of the Mediterranean sea.

Oceanography—North Sea. *P.R.S. Edinburgh* 22 (1897-99): 478-481.

Buchan

Tidal Currents of the North Sea. By Alexander Buchan, LL.D., F.R.S.

Phænology.

Phänologische Mitteilungen (Jahrgang, 1899). Von E. Ihne. (Sonderabdruck aus dem xxxiii. Bericht der Oberhess. Ges. f. Natur- u. Heilkunde zu Giessen.) Size 9×6 , pp. 30. Presented by the Author. Ihne

Instructions for observing the annual recurrence of seasonal changes in plants, with a special notation for recording the phenomena, a summary of recent literature on the subject, and a note on the influence of latitude on the date of the beginning of spring which states that in Germany the commencement of spring is four days later for each degree of latitude towards the north. See note, *ante*, p. 680.

Phyto-Geography. *La G., B.S.G. Paris* (1900): 35-40.

Masclef

La Géographie botanique et son évolution au XIX^e siècle. Par M. A. Masclef.

Sand-dunes.

Baschin

Die Entstehung der Dünen. Von Otto Baschin. (Centralblatt der Bauverwaltung. XX. Jahrg. Nr. 38, 16 Mai 1900, pp. 231-232.) Size $13\frac{1}{2} \times 10$. Presented by the Author.

Seismology.

P.R.S. Edinburgh 22 (1897-99): 578-585.

Knott

The Propagation of Earthquake Vibrations through the Earth. By Prof. C. G. Knott, D.Sc. (Abstract.)

- Terrestrial Magnetism.** *Ann. Hydrographie* 28 (1900): 363-370, 435-445.
 Bericht der Deutschen Seewarte über die Ergebnisse der magnetischen Beobachtungen in dem deutschen Küstengebiet und in den deutschen Schutzgebieten während der Jahre 1897, 1898, und 1899.
- Tide.** *Nautical Mag.* 69 (1900): 466-483. **Moxly.**
 The New Theory of Tide. By Rev. J. H. S. Moxly.
- Tides.** *Nautical Mag.* 69 (1900): 549-553. **Plumstead.**
 Moxly's Theory of the Tides. By E. Plumstead.
- Volcanic Phenomena.** *Rev. Maritime* 146 (1900): 55-69. **Thoulet.**
 Les phénomènes volcaniques dans leurs rapports avec l'océanographie. Par J. Thoulet.
 Refers to volcanoes in general, and goes on to deal specially with submarine eruptions and the influence of volcanic phenomena on oceanic deposits.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

- Ancient Empires.** **Maspero.**
 The Passing of the Empires, 850 B.C. to 330 B.C. By G. Maspero. Edited by A. H. Sayce. Translated by M. L. McClure. London: Society for Promoting Christian Knowledge, 1900. Size 11 x 7½, pp. xii. and 824. *Maps and Illustrations.* Price 25s.
 This volume concludes Prof. Maspero's great work on the history of the ancient East down to the downfall of Assyria and Egypt.
- Historical.** **Beazley.**
 New Light on some Mediæval Maps. (IV.) By C. Raymond Beazley, M.A. (From the *Geographical Journal* for September, 1900.) Size 10 x 6½, pp. 12. *Facsimile Map.*
- Statistics.** *J.R. Statistical S.* 63 (1900): 459-479. **Craigie.**
 Address to the Economic Science and Statistics Section of the British Association, held at Bradford, 1900. By Major P. G. Craigie, President of the Section.
 On the collection of statistics, especially with regard to the census of the United Kingdom and to agricultural statistics in general.

BIOGRAPHY.

- Gerlache and Lecoq.** *Deutsche Rundschau G.* 22 (1900): 470-471.
 Capitän Adrien de Gerlache und Lieutenant Georges Lecoq. *With Portraits.*
 The commandant and captain of the Belgian Antarctic expedition.
- Grabowsky.** *Deutsche Rundschau G.* 22 (1900): 516-519.
 Friedrich J. Grabowsky. *With Portrait.*
 Herr Grabowsky made a journey of exploration in Borneo in 1880, and subsequently travelled extensively in the Malay archipelago and New Guinea, making ethnographical collections.
- Jagor.** *Deutsche Rundschau G.* 22 (1900): 520-521.
 Dr. Friedrich Jagor. *With Portrait.*
 Born in 1817, the son of an hotel-keeper; died in 1900, a distinguished ethnologist and scientific traveller.
- Oswell.** **Oswell.**
 William Cotton Oswell, Hunter and Explorer. The Story of his Life, with certain correspondence and extracts from the private journal of David Livingstone, hitherto unpublished. By his eldest son, W. Edward Oswell. With an Introduction by Francis Galton, D.C.L., etc. 2 vols. London: W. Heinemann, 1900. Size 9 x 6, pp. (vol. i.) xxiv. and 268; (vol. ii.) xii. and 290. *Portraits, Maps, and Illustrations.* Price 25s. net. *Presented by the Publisher.*
 This biography gives for the first time full details of the part played by the late Mr. Oswell in promoting and facilitating the early travels of Dr. Livingstone.
- Smith.** *Scottish G. Mag.* 16 (1900): 597-599. **[Geddes.]**
 Robert Smith, B.Sc. By P. G. *With Portrait.*
 A sympathetic notice of the life of Robert Smith, who, though only twenty-six years of age at his death, had qualified himself in a remarkable manner for the study

of botanical distribution, and whose botanical surveys of two of the 1-inch map-sheets of Scotland published this year are examples of how such work should be carried on.

GENERAL.

Astral Gravitation.

Jordan

Essays in illustration of the action of Astral Gravitation in Natural Phenomena. By William Leighton Jordan. London: Longmans & Co., 1900. Size 9 x 6, pp. xvi. and 192. *Diagrams. Presented by the Author.*

"Astral gravitation is a convenient term, and seems to me the most appropriate possible term, for representing generally the *resisting force* of gravitation opposing motion. . . . It is the combined action of the gravitation of the universe, *except* the force whose action it opposes. . . . Newton excluded this force . . . but, I say, has effective action in every detail of terrestrial phenomena." Such is the author's definition of the power in Nature whose effects he proceeds to trace.

Bibliography.

Baschin

Bibliotheca Geographica, herausgegeben von der Gesellschaft für Erdkunde zu Berlin. Bearbeitet von Otto Baschin. Band vi. Jahrgang 1897. Berlin: W. H. Köhl, 1900. Size 9½ x 6, pp. xvi. and 444. *Price 8 mark.*

This exhaustive geographical bibliography contains over 9000 titles of works published in 1897, including for the first time those appearing in Japanese.

Educational.

Pettipiece

The Intermediate School Geography (Junior Grade). By T. W. Pettipiece. Dublin: Blackie & Son [not dated]. Size 6½ x 4½, pp. 144. *Maps and Illustrations. Price 1s. Presented by the Publishers.*

Maps and diagrams, accompanied by lists of names of capes, bays, and similar features, with numerous small-type notes.

Educational.

Pettipiece

The Irish School Geography for Elementary and Intermediate Schools. By T. W. Pettipiece. Part iii. Dublin: Blackie & Son [not dated]. Size 6½ x 4½, pp. 96. *Maps and Illustrations. Price 6d. Presented by the Publishers.*

Highly compressed information illustrated by good sketch-maps.

Educational—Geography Chains.

Penck

Die Begründung der Lehrkanzel für Geographie und des geographischen Institutes an der Universität Wien. Von Dr. Albrecht Penck. Wien: Ed. Hölzel, 1898. Size 10½ x 7, pp. 14. *Presented by the Author.*

On the foundation of the Chain of Geography in the University of Vienna.

Medical Geography.

Newman

Bacteria, especially as they are related to the economy of nature to industrial processes and to the public health. By George Newman, M.D., etc. Second Edition, with additional matter, including New Chapters on Tropical Diseases and the Bacterial Treatment of Sewage. London: John Murray, 1900. Size 8½ x 6, pp. xvi. and 398. *Illustrations. Price 6s. Presented by the Publisher.*

The chapter on the Bacteriology of Tropical Diseases deals with the causes and mode of transmission of malaria, plague, leprosy, cholera, and yellow fever.

Parliamentary Reports, etc.

Catalogue of Parliamentary Reports, Papers, etc., relating to Miscellaneous Subjects, 1800 to 1879. Part ii. London: P. S. King & Son [1900]. Size 8½ x 5½, pp. 20.

Place-names.

B.S.G. Lyon 16 (1900): 365-436.

Steyer

Étymologies Lyonnaises. Réponse à M. l'Abbé Devaux. Par M. A. Steyert.

On place-names and their transformations in passing from one language to another.

Rumanian Geographical Society.

Societatea Geografică Română. Buletin Număr Jubilar pentru împlinirea a 25 ani 1875, 15 Junie, 1900. București, 1900. Size 9½ x 7, pp. vi. and 126. *Portraits. Presented by the Rumanian Geographical Society.*

The Rumanian Geographical Society, in celebration of its semi-jubilee, has published a special number of its *Bulletin*, giving an account of the work of the Society, a summary of the contents of the *Bulletin* from the beginning, a list of members, and portraits of the King and leading officers of the Society.

Travel.

Baring-Gould.

With Note-book and Camera. A Winter Journey in Foreign Lands. By Edith M. E. Baring-Gould. With Preface by Sir W. Mackworth Young, K.C.S.I., Lieut.-Governor of the Punjab. London: Church Missionary Society, 1901 [1900]. Size $8\frac{1}{2} \times 6\frac{1}{2}$, pp. viii. and 104. *Illustrations.* Price 1s. 6d. Presented by the Church Missionary Society.

Snapshots taken on a journey to India and back.

Travel.

B.S.G. Lyon 16 (1900): 509-540.

Groffier.

Explorations et travaux géographiques des Missionnaires Catholiques en 1899. Par M. Valérien Groffier.

Travel.

Selous.

Sport and Travel East and West. By Frederick Courteney Selous. London: Longmans & Co., 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. x. and 312. *Illustrations.* Price 12s. 6d. net. Presented by the Publishers.

In this volume Mr. Selous describes a series of hunting-trips in Asia Minor and North America, with a number of photographs and drawings of game and incidents of travel. The book is divided about equally between Asia Minor, which was visited in 1894-95, and the Rocky mountains, in which two trips were made in 1897 and 1898, and from both parts of the world there are many notes bearing on natural history, and especially on ornithology.

Tropical Agriculture. *Imp. and Asiatic Quarterly Rev.* 10 (1900): 246-251. Wallace.

The Garton lectures on Colonial and Indian Agriculture in Edinburgh University. By Robert Wallace.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England and Wales.

Ordnance Survey.

Publications issued since October 8, 1900.

1-inch—General Map:—

ENGLAND AND WALES (revision):—128, hills engraved in black or brown. 1s.

6-inch—County Maps:—

ENGLAND AND WALES (revision):—**Berkshire**, 33 s.w., 37 n.e., 42 n.w., s.w. **Bucks**, 9 n.e., 10 n.w., 12 n.w., 13 n.e., 15 s.e. **Cumberland**, 41 n.w., s.w., s.e., 42 s.w., 48 s.w., 49 n.w., s.w., 50 n.w., n.e., 55 n.e., 58 n.w., 61 s.w., s.e., 62 n.e., s.w., s.e., 63 n.w., s.e., 64 complete, 65 n.e., s.w., s.e., and 71 n.e., 66 n.w., 67 s.w., s.e., 68 s.w., s.e., 69 n.e., 70 n.e., 72 complete, 73 s.e., 77 s.e., 78 s.w., s.e., 79 n.w., s.w., s.e., 82 n.w., 83 n.w., 88 n.e., 90 s.w. **Denbighshire**, 6 s.w., 8 s.e., 12 s.w., 17 n.w., 19 n.w., 24 n.w., 25 s.w., 26 n.w., 27 s.e., 34 s.w., 38 s.e. **Derbyshire**, 36 n.w., 40 n.w. **Glamorganshire**, 4 s.w., 8 s.e., 14 n.e., 15 s.w., 17 s.w., 23 s.e., 25 n.w., s.w., 26 s.w., s.e., 31 n.e., 33 n.w. and 33A n.e., 33 s.w., s.e., 34 n.w., s.w., 35 n.e., s.e., 39 n.w., n.e., 40 n.e., s.e., 42 s.w., s.e., 44 n.w., s.w., and s.e., 45 s.w. **Northamptonshire**, 61 n.e., 62 n.e., 63 n.w., s.w. **Nottinghamshire**, 14 s.w., 15 n.e., 16 n.w., s.w., 27 n.e., 28 n.w., 30 n.w., s.w., s.e., 31 n.w. **Oxfordshire**, 3 n.w., 6 s.w., 10 s.e., 11 s.w., 13 n.e., 14 s.w., 58 n.e. **Staffordshire**, 1 s.w., 3 n.w., n.e., s.w., 8 s.w., 9 n.w., s.w., 11 n.w., n.e., s.w., 12 n.w., n.e., s.e., 13 s.w., n.e., 14 n.w., s.w. **Wiltshire**, 30 s.w. 1s. each.

25-inch—Parish Maps:—

ENGLAND AND WALES (revision):—**Anglesey**, XI. 2, 16; XVIII. 3; XXII. 1, 8, 10; XXIII. 6. **Carnarvonshire**, VI. 16; IX. 1, 5; XI. 6, 13, 14, 15; XII. 1, 5, 9, 10; XIII. 4; XIV. 6, 9, 11, 15; XV. 11; XVI. 11, 12, 14, 15, 16; XVII. 1, 13; XVIII. 16; XX. 6, 14; XXI. 3, 8, 11, 12, 13; XXII. 14, 15; XXIII. 13, 14, 15, 16; XXIV. 5, 6, 11, 13; XXV. 8, 11; XXVI. 5, 6, 7, 8, 9, 10, 13, 15; XXVII. 1, 3, 4, 9, 10; XXIX. 8; XXX. 1, 7; XXXIII. 1, 2; XXXIV. 2, 6; XXXIX. 4. **Cumberland**, XIV. 12; XXVII. 14; XXVIII. 13, 14, 15, 16; XXIX. 13, 14, 15, 16; XXX. 13, 14, 15, 16; XXXI. 13, 14, 15, 16; XXXII. 14; XXXVI. 2, 3, 4;

XXXVII. 1, 2, 3, 4, 5, 6, 7, 8; XXXVIII. 1, 2, 3, 4, 5, 6, 7, 8, 11; XXXIX. 1, 2, 3, 4, 5, 6, 10, 12; XL. 6, 10; XLIV. 8; LX. 5. **Derbyshire**, XL. 13; XLI. 1, XLV. 3, 4, 6, 7, 9, 10, 11, 12, 14, 15, 16; XLVII. 3; LVI. 1, 2. **Glamorganshire**, V. 16; VI. 10; XI. 15; XII. 11; XIX. 3, 14; XXVIII. 2, 7, 14; XXXVII. 3, 11, 13, 15; XLIII. 1; XLVII. 7, 9, 10, 11, 14, 15; L. 8; LVII. 3, 5. **Northamptonshire**, XVI. 3, 4, 10, 11, 13, 14; XXII. 3, 4, 6; XXIII. 2, 3, 5, 6, 7, 8, 14; XXIV. 1, 2, 3, 5, 6, 10, 11; XXXI. 4, 6, 9; XXXII. 1, 3, 4, 12; XXXIII. 1, 3, 9, 10, 13, 14, 15, 16; XXXIV. 9, 13; XXXIX. 2, 4, 7, 8, 11, 12, 13, 16; XL. 2, 3, 4, 5, 7, 8, 11, 13, 14, 15; XLI. 1; XLIV. 16; XLV. 4, 8, 15; XLVI. 1; XLVII. 2, 6; LVI. 6. **Nottinghamshire**, XXXII. 1; XXXIV. 3; XXXV. 3, 4; XXXVIII. 1, 3, 4, 6, 7, 8, 10, 11, 12; XXXIX. 5, 13; XLIII. 1, 7, 9, 15; XLV. 2; XLVI. 14, 15; XLVII. 1, 2, 3, 14, 15; XLVIII. 5; L. 1, 2, 3, 4, 7, 8, 10, 11, 12; LI. 2, 3, 5, 6, 9, 10 and 11, 13; LIV. 1. **Wiltshire**, X. 15, 16; XI. 13; XV. 2, 6, 9, 10, 11, 12, 13, 14, 15, 16; XXII. 2, 3, 4; XXV. 10, 11; XXVI. 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16; XXVII. 6, 13, 14; XXVIII. 13; XXXV. 1, 14, 15, 16; XLII. 1; XLVIII. 1, 3, 4, 7, 8, 12; XLIX. 1, 5. *3s. each.*
(*E. Stanford, Agent.*)

England and Wales.**Bartholomew**

Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet 23, Hereford. J. Bartholomew & Co., Edinburgh, 1900. *Price 2s. Presented by the Publishers.*

Historical Atlas.**Pool**

Historical Atlas of Modern Europe from the Decline of the Roman Empire, comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lane Poole, M.A., Ph.D., Lecturer in Diplomatic in the University of Oxford. Part xxvii. Oxford: The Clarendon Press; London, Edinburgh, Glasgow, and New York: Henry Frowde, M.A.; Edinburgh: W. & A. K. Johnston. 1900. *Price 3s. 6d. Presented by the Clarendon Press.*

This part contains the following maps: No. 8, Europe at the accession of the Emperor Charles VI., 1519, by C. Oman, M.A.; No. 24, England and Wales, showing the Parliamentary Representation according to the Reform Act of 1832, by the Editor No. 65, Italy, circa 1060-1167, by Miss Lina Eckenstein. Each map is accompanied by brief explanatory letterpress.

Spain.**Deposito de la Guerra, Madrid**

Mapa Militar de la Capitanía General del Norte. Scale 1 : 500,000 or 7·8 stat. miles to an inch. Deposito de la Guerra, Madrid, 1900. Part vi. *Price 1.50 pts.*

This map forms one of a series of military maps of Spain now in course of publication by the Spanish War Office, and includes the provinces of Santander, Vizcaya, Guipuzcoa, Alava, Navarra, Logroño, and Burgos. No hill work is shown, but roads are indicated in red, and many place-names are given.

ASIA.**Asia Minor.****Huber**

Empire Ottoman, Division Administrative. Scale 1 : 1,500,000 or 23·6 stat. miles to an inch. Par R. Huber. Paris: F. Loeffler. 4 sheets.

China.**Richtshofen**

Karte des nordöstlichen China von F. v. Richtshofen. Scale 1 : 3,000,000 or 473 stat. miles to an inch. Berlin: Dietrich Reimer (Ernst Vohsen), 1900. *Price 1 mark.*

This is No. 3 of a series of maps of China now in course of publication in connection with the present military operations, based upon the surveys of Baron F. von Richtshofen with additional information. The present sheet includes Pekin, the Liau-tung and Shantung peninsulas, the entrance to the Yang-tse-kiang, and the region to the west as far as Szechuan and Kansu. It is coloured to show physical features, the lowlands being tinted green and the highlands brown, in addition to the usual hill shading.

AFRICA.**Egypt.****Schweinfurth**

Aufnahmen in der Östlichen Wüste von Ägypten, von Georg Schweinfurth. 1 Serie (10 Blätter). Blatt IV., Die südliche Galäla. Scale 1 : 200,000 or 3·1 stat. miles to an inch. Blatt V., Die krystallinischen Küstengebirge am Roten Meer

zwischen dem Uadi Qeneh und Gebel Sët. Scale 1:200,000 or 3·1 stat. miles to an inch. Berlin: D. Reimer (Ernst Vohsen), 1900.

The first portfolio of maps belonging to this series appeared last year, and was noticed in the *Geographical Journal* for June, 1899. This second issue contains only two maps, Nos. IV. and V., which include that portion of the desert between the Nile and the Red Sea situated approximately within the parallels of 27° and 29° 10' N. lat., and between long. 31° 50' E. and the coast. They show the results of Dr. Georg Schweinfurth's explorations and surveys undertaken in the years 1876-77-78, 1884-85, and 1887, and furnish a valuable addition to our knowledge of the geography of this region. The maps are printed in four colours—hill work brown, dry beds of streams green, water blue, and outline, routes and lettering black. Numerous notes on the character of the country traversed are added, and on Sheet V. there is a section showing the geological features of the region from Mount Om Mangul to the sea, along the parallel of 27° 15' N. lat. Information obtained from the explorations of other travellers is fully acknowledged.

South Africa.

Bower.

Large-scale Map of the Southern Transvaal and Northern Orange River Colony, with inset of Lydenburg District. Scale 1:253,440 or 4 stat. miles to an inch. Compiled from original surveys and official sources by Thomas Bowyer Bower, A.M.I.C.E., M.I.M.M., F.R.G.S. London: George Philip & Son, 1900. 3 sheets and index. Price £2 12s. 6d. Presented by the Author.

Up to the present time this is, doubtless, the best map that has been published of the area it represents, and its scale, 4 miles to an inch, is sufficiently large to admit of a considerable amount of detail being shown without overcrowding. It includes the country from Heilbron, in the Orange River Colony, on the south, to Wolvekraal on the Elands river, on the north, and from Klerksdorp, on the west, to the borders of Swaziland on the east. Pretoria and Johannesburg thus appear in about the centre of the map. On the western sheet there is an inset of part of the Lydenburg district on the same scale as the map itself. The map is printed in colours, and, in addition to the general topographical features and information usually contained on such maps, it shows farms with their official numbers, proclaimed goldfields, and gold reefs.

Mr. Bowyer Bower, the compiler of the map, has had exceptional opportunities for obtaining accurate information, and has himself surveyed a considerable extent of this area, besides which he has made good use of the surveys of others; thus his map will be most serviceable at the present time, although before long it is to be hoped that the country will be systematically triangulated and surveyed on a large scale. A useful index to the names of farms which appear on the map is given as a supplement.

AMERICA.

Argentina.

Buenos Aires and Pacific Railway Co., Ltd.

Argentine Railways, 1900. Issued by the Buenos Aires and Pacific Railway Co., Ltd., London. Scale 1: 2,534,400 or 40 stat. miles to an inch. Inset map of Buenos Aires. Scale 1: 300,000 or 4·7 stat. miles to an inch. Presented by the Buenos Aires and Pacific Railway Co.

A roughly produced map, lithographed in colours, but showing very clearly the different railways and railway systems of the Argentine Republic up to date.

GENERAL.

French Colonies.

Pelet.

Atlas des Colonies Françaises. Dressé par ordre du Ministère des Colonies. Par Paul Pelet. Paris: Armand Colin & Cie. Livraison iii. Price 3 fr.

The three maps contained in this part of Pelet's atlas of the French colonies are as follows: No. 9, Afrique Occidentale, I. Sénégal, 1: 3,000,000; No. 12, Congo (feuille sud), 1: 300,000; and No. 26, Polynésie: Établissements français de l'Océanie, on various scales. Like those previously published, these maps have been carefully produced, and are printed in colours. Considerable time has, however, been allowed to elapse between the time of their engraving and that of their publication, as the first is dated April, 1899; the second October, 1899; and the third 1898. Statistical and descriptive information accompanies each map.

Map Slides.

Dickinson and Andrews.

The "Diagram" Series of Geographical Lantern Slides of Maps. By B. B. Dickinson, M.A., and A. W. Andrews, M.A. To be obtained from G. Philip & Son, London. Price 1s. 6d. each (coloured).

Messrs. Dickinson and Andrews deserve the thanks of all geographical lecturers

No. VI.—DECEMBER, 1900.]

3 B

and teachers for having produced a series of most useful and effectively coloured lantern slides of maps of all parts of the world, which deserve to be more widely known and generally used than they are at present. The following is a list of those recently published, in addition to others which were noticed in the *Geographical Journal* for June, 1899:—

The World.—(1) Orographical; (2) Mean annual rainfall; (3) Rainfall, December, January, February; (4) Rainfall, March, April, May; (5) Rainfall, June, July, August; (6) Rainfall, September, October, November; (7) Wind systems, January; (8) Wind systems, July; (9) Isobars, January; (10) Isobars, July; (11) Cables and telegraph lines; (12) Steamship routes and principal railways; (13) Strategic importance of the Canadian Pacific Railway.

Europe.—(14) British Isles, orographical; (15) England and Wales, orographical; (16) Wales, orographical; (17) Scotland, orographical; (18) Ireland, orographical; (19) France, political, 1789; (20) France, chief wine districts; (21) France, orographical; (22) German Empire, river basins; (23) German empire, orographical; (24) Holland and Belgium, river basins; (25) Holland and Belgium, political; (26) Netherlands, orographical; (27) Iberian peninsula, political; (28) Iberian peninsula, river basins; (29) Italy, river basins; (30) Italy, orographical; (31) Balkan peninsula, political; (32) Balkan peninsula, river basins; (33) Balkan peninsula, orographical; (34) Russia, river basins; (35) Austrian empire, orographical; (36) Austrian empire, river basins; (37) Switzerland, chief passes; (38) Switzerland, political; (39) Switzerland, river basins.

Asia.—(40) Asia, orographical; (41) South-East Asia, means of communication; (42) South-East Asia, commercial; (43) South-East Asia, orographical; (44) Indian empire, orographical; (45) North-West Frontier, political.

Africa.—(46) Means of communication; (47) Orographical; (48) Africa in 1884, before Berlin conference; (49) Africa in 1885, after Berlin conference; (50) Africa at the close of the Brussels conference, 1890; (51) Cape Colony, commercial; (52) Cape Colony, communications; (53) Cape Colony, south-west, orographical; (54) Cape Colony, east, orographical; (55) Cape Colony, west, orographical and political; (56) Cape Colony, west, political; (57) Natal, orographical; (58) British Central Africa, orographical.

America.—(59) North America, orographical; (60) North America, river basins; (61) North America, economic (minerals); (62) Canada, political; (63) Canada, mean temperature, June, July, August; (64) North-West Canada; (65) British North America, orographical; (66) British North America, zones of vegetation; (67) United States, historical, 1782; (68) United States, orographical; (69) United States, river basins; (70) United States, political; (71) Central America, political; (72) South America, orographical.

Australia.—(73) Orographical; (74) New Zealand, mean annual rainfall; (75) New Zealand, means of communication.

World.

Philip.

Phillips' London School Board Atlas. A series of forty coloured plates, containing over ninety maps and plans, printed in colours, and 8 pages of introductory letterpress. Edited by G. Philip, Junr., F.R.G.S. London: George Philip & Son, 1900. Price 1s. Presented by the Publishers.

This is a commendable attempt to produce a school atlas at a low price on the more enlightened and improved system of teaching geography, and certainly it is a great advance on the cheap school atlases published fifteen or twenty years ago. It has been compiled by Mr. George Philip, Junr., according, as it is stated in the introductory remarks, to the recommendations of a special advisory committee of the London School Board. The maps are both physical and political, and in some cases the latter are drawn on the same scale as the former. The relief is shown by hill-shading and tints of colouring, but occasionally the difference between the latter is not sufficient to be clearly distinguished. One commendable feature of the atlas is that the scales on which the maps are drawn all bear a fixed and simply expressed proportion to one another; that of the maps of the British Isles (1 : 5,000,000) has been taken as the unit, and as many maps as possible have been drawn on this scale. Insets of England or the British Isles, on the scale of the general maps, have been given on all the maps dealing with regions lying outside Europe. Care seems to have been taken in the selection of place-names, and in their spelling the system recommended by this Society has been taken as the guide. Preceding the maps are several pages of introductory letterpress, giving information on map-reading, scales of maps, projections, and matters of a kindred character, which in some respects might be improved and corrected. For instance, in reference to Mercator's projection it is stated that on it "the shortest distance between any two places on the Earth's surface can be found by simply connecting them with a straight line," and that "it is this feature

which makes Mercator's projection so useful to sailors." This is evidently a mistake. What is doubtless intended is that the correct bearing between any two places is shown by connecting them by a straight line, which is quite a different thing from the "shortest distance" between them.

Although there is room for improvement, still, bearing in mind the low price of the atlas, it must be considered, on the whole, to be a really creditable production, and furnishes additional evidence of the fact that the efforts of this Society in the direction of geographical education are beginning to bear fruit.

World.

Vivien de Saint Martin and Schrader.

Atlas Universel de Géographie. Ouvrage commencé par M. Vivien de Saint Martin et continué par Fr. Schrader. Paris: Librairie Hachette et Cie. Sheets: 21, Italie; 40, Russie Orientale et Caucasic. Price 2 fr. each sheet. Presented by the Publishers.

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1673 Jacuacanga bay.	New plan. Port Angra dos Reis and Jacuacanga bay
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14 Plan of Kamarau bay on this sheet.	

Charts that have received Important Corrections.

No. 2973, England, south coast:—Cowes harbour. 2693, England, east coast:—Orwell and Stour rivers. 108, England, east coast:—The Wash, Skegness, Blakeney. 1770, Baltic:—Port of Libau. 199, Adriatic:—Brindisi to Orto. 1559, Adriatic:—Gulf of Trieste. 1561, Adriatic:—Ports and anchorages in gulf of Quarnero. 1581, Adriatic:—Approaches to Port Sebenico. 1612, Adriatic:—Ports and anchorages in Dalmatia. 1238, South Shetland and South Orkney islands. 852, United States, east coast:—Sapelo sound to St. Andrew sound. 12 South America, west coast:—Guaytecas islands to Cape St. Antonio. 579, British Columbia:—Fraser river to north-east point of Texada island. 22, Persian gulf:—Kuweit harbour. 1413, Andaman islands:—Long island to Port Blair. 94 Eastern Archipelago, eastern portion. 2194, Anchorages in northern part of Celebes. 2759A, Australia, northern portion. 1043, Australia, north coast:—Gulf of Carpentaria. 1044, Australia, north coast:—Gulf of Carpentaria to Cape Ford. 10 Australia, north coast:—Cape Stewart to Port Essington. 613, Australia, north coast:—Melville island. 475, North-west coast of Australia. 1047, Australia, west coast:—Cape Ford to Buccaneer archipelago. 1055, Australia, west coast:—Bedout island to Cape Cuvier. 917, Harbours and anchorages on west coast of Australia. 413, Australia, south coast:—Cape Mentelle to White point. 21 Tasmania:—Port Davey. 447, Western approaches to Torres strait. 1970, New Zealand:—Auckland harbour entrances. 981, Caroline islands:—Seniavina island (J. D. Potter, Agent.)

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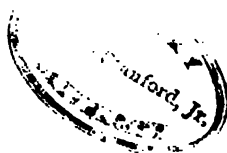
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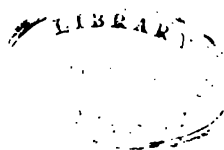


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1





Africa—continued.

- Geographical Progress in, 599†
 Geographischen Forschungen und Reisen in 1899, von O. Lenz, 579†
 German East: Ancient Ruins in, Herr Perrot's explorations of, 561; Trade of Coast Towns (Foreign Office Rep.), 368†; Reise durch die hamitischen Sprachgebiete um Kondoa, von Hauptman Kannenberg, 368†; Notizen über Lebensweise . . . des Bezirks Bukoba, von Hauptmann Richter, 368†; Geographische Ortsbestimmungen in Ostafrika, von R. H. Schmitt, 368†; Fortschritte der Pendel Expedition, 250†, 368†; Die Warangi, von Lieut. Baumstark, 250†; Ergebnisse der geologischen Expedition des Bergassessors Dr. Dantz, 250†; note on, 106; Vegetationsverhältnisse des Ulugurubirges in Deutsch-Ostafrika, von A. Engler, 250†; Photographieen aus Deutsch-Ostafrika, von H. Siedel, 250†; Bericht über meine Reisen . . . in Deutsch-Ostafrika, von Dr. R. Kandt, 580†; note on, 559; Resultate . . . meteorologischer Registrirapparate in Deutsch-Ostafrika, von Dr. H. Maurer, 580†; Die Königsgräber der Wahehe, von J. Stierling, 488†
 German South-West: Bericht über eine Reise nach dem Okavangogebiet, von Lieut. Eggers, 580†; note on, 561; Das Land zwischen Inachab und Bethanien, von F. Gessert, 250†; Buren in Deutsch-Südwest-Afrika, von Paul Langhans, 251†; Die Eingeborenen Deutsch-Südwest-Afrikas, von P. H. Brincker, 488†; Meteorologischen Beobachtungen in Swakopmund, 368†; Notes on a Journey in, by J. C. Watermeyer, 368†
 German West: Land und Leute an der Südgrenze Westadamaus, 580†; Zur Harmattan-Frage, von F. Gessert, 251†
 In Dwarf Land and Cannibal Country, by A. B. Lloyd, 369†
 Journey from Fort Jameson to Old Chitambo and the Tanganyika Plateau, by R. Codrington, 124†
 Komati River, M. A. Grandjean's explorations on the, 350
 Maps: Carte d'Afrique (Service Géol. de l'Armée), 262†; Stanford's map of Morocco, Algeria, etc., 378†; Northern Portion of the Transvaal, etc., by Wood and Ortlepp, 378†; Southern Transvaal and Northern Orange River Colony, by T. B. Bower, 709†
 North-East: Reise in Nordost-Afrika, von C. v. Erlanger und O. Neumann, 581†
 Portuguese East: Le bassin du Nkomati,

Africa—continued.

- par A. Grandjean, 124†; La cartographie de la province de Lourenço Marques, par A. Grandjean, 125†; Le Zambéze et le Shire, par M. Lovéque, 369†; Macombe's Country, by Dr. Carl Peters, 369†; Trade of Mozambique and Quillimane, 251†;
 Portuguese Province of Gaza, report on, by Captain Gomes da Costa, 350
 Scoperte geografiche del Secolo XIX del Prof. F. Porena, 579†
 Slavery and the Slave Trade in, Correspondence respecting, 580†
 South: Boers and Uitlanders, by Yves Guyot, 251†; Further Correspondence respecting, 251†; Geographisches über den Kriegsschauplatz in Südafrika, von Prof. Dr. Dove, 251†; Durch die Karroo nach Kimberley, von Dr. S. Passage, 251†; Transvaal and South Africa, by Colgreave, 125†; Les Premiers Boers, par E. Fournier de Flaix, 125†; De Oranje Vrijstaat, door D. Aitton, 370†; South African Reconstruction, by Ed. Dicey, 370†; Influence of Geographical Conditions on Military Operations in, by Major W. A. Simpson, 370†; The Climate of, by A. J. Herbertson, * 370†; Coal Measures at Vereeniging, Transvaal, etc., by E. J. Dunn, 370†; Two Thousand Miles through South Africa, by Rev. W. T. McCormick, 581†; Renaissance of, by A. R. Colquhoun, 700†; Boers et leur état social, par J. Leclercq, 700†
 Through Africa from the Cape to Cairo, by E. S. Grogan, 164*, 699†; From the Cape to Cairo, etc., by E. S. Grogan and A. H. Sharp, 699†
 West: Franco-Spanish Boundaries in, 225; Mission Hostains-d'Ollone, 700†
 Agamennone, G., Sismoscopio elettrico a doppio effetto per le scosse sussultorie, 258†
 Agassiz, A., Explorations of the *Albatross* in the Pacific, 128†, 255†
 Ahlenius, K., Till kändedom om Skandinavien geografi och Kartografi, 694†
 Aisen river and valley, Patagonia, 24, 201
 Aitton, D., De Oranje Vrijstaat, 370†
 Akar river, Borneo, 42
 Akara tribe, East Central Africa, 618
 Alanso river, Patagonia, 21
 Alaska—
 Ascent of Mount St. Elias by H.R.H. the Duke of the Abruzzi, by F. de Filippi, 252†
 Domestic Reindeer, Annual Report of the Introduction of, 701†
 Minder fra Alaska af ingeniør Ole Falk Moe, 489†
 Report of the Governor of, 701†

Alaska—continued.

Russian-American Mining and Exploration Company, 125 †

Albania—

Itinerari albanesi, del A. Baldacci, 574 †

Albert Edward Nyanza, shrinkage and geysers of, 175

Albrecht, T., Bericht über den Stand der Erforschung der Breitenvariation am Schlusse des Jahres 1899.. 256 †

Alexandria—

Temple du Césaréum et l'Église patriarcale d'Alexandrie, par S. B. Monseigneur Kyrillos II., 249 †

Alford, C. J., A Report on Ancient and Prospective Gold Mining in Egypt, 367 †; explorations for gold in Egypt, 557

Algeria—

Algériscen Atlasgebirge, Aus dem, von Dr. R. Zeller, 579 †

Among the Berbers of, by A. Wilkin, 699 †

Maps: Carte d'Algérie (Service Géo. de l'Armée), 263 †

Trade of (Foreign Office Rep.), 579 †

Algiers—

Illustrated Guide to, by J. C. Hyam, 249 †

Algué, J., Les cyclones aux Philippines et dans les mers de Chine, 486 †

Alichur valley, Pamirs, 668

Allidridge, A. T., Award to, 117

Allingham, W., Time and its Curious Contradictions, 256 †

Alpine Club, A Letter addressed to the Members of the, 376 †

Alps—

Eastern: Erinnerung an die vorge-schichtlichen Bewohner der Ostalpen, von J. Ranke, 242 †

Eiszeit im Bereiche der Alpen, Die verte, von A. Penck, 694 †

Ghiacciai italiani del gruppo del Pizzo Bernina, del Prof. L. Marson, 483 †

Glaciers des Alpes, Variations périodiques des, par Drs. Forel, Lugeon, et Muret, 569 †

Scrambles amongst the Alps in the years 1860-69, by Ed. Whymper, 569 †

Scrambles in the Eastern Graians, by G. Yeld, 483 †

Simplon Tunnel, The Construction of the, by C. B. Fox, 483 †

Travels through the, by the late J. D. Forbes, 242 †

Tunnels, Great Alpine, by F. Fox, 483 †

Vernagtferner, Der, von A. Penck, 694 †

Altai and Mongolia, After Wild Sheep in the, by E. Demidoff, 696 †

Alton, Dr. J., Enneberg in seinen wirthschaftlichen und sozialen Verhältnissen, 242 †

Altyn Tagh, M. Bonin's journey in the, 99

Amatovo, Lake, Macedonia, 218

Amazon—

A Thousand Miles up the, by J. Jones, 490 †

Amazonas, State of (Foreign Office Rep.), 584 †

Amboina—

Reis door einige eilandengroepen der Residentie Amboina, door J. H. de Vries, 697 †

Ambriz and San Salvador, Determination of the latitude of, by C. Sanders, 699 †

Amdrup, Lieut., Expedition to East Greenland, 231, 481, 597; The Danish East Greenland Expedition in 1900.. 662 *

America—

Central: Convention . . . relative to the Establishment of a Communication by Ship Canal between the Atlantic and Pacific, 254 †; Hieroglyphic Inscriptions of, by J. Campbell, 585 †; Volcanic Studies in, by Dr. Sapper, 478

North: Discovery of:—Zum neunhundertjährigen Jubiläum der erster Entdeckung Amerikas, von Franz Stock, 131 †; Epicontinental Sea of Jurassic Age, by W. N. Logan, 582 †; Geology, Paleontology, etc., Bibliography and Index of, by F. B. Weeks, 489 †; Lakes of, Shipping and Shipbuilding on the (Foreign Office Rep.), 489 †; note on, 353; Map: Relief Map of Canada and the United States (Geological Survey of Canada), 137 †; Territoire d'Alberta à l'État d'Iowa par le Far-West, par M. E. Petitot, 371 †

South: Commercial Map of, by J. Bartholomew, 263 †; Geographische Erforschung Südamerikas im 19 Jahrhundert, von W. Sievers, 372 †; note on, 478

Amoy, Trade of (Foreign Office Rep.), 576 †

Amsterdam, Trade of (Foreign Office Rep.), 485 †

Amundsen, E., A Journey through South-West Sechuen, 531 *

Anadyr, The Territory of, by E. Olssuffjev, 578 †

Anderson, Dr. John, obituary of, 481

Andersson, G., Physische Geographie von Schweden, 121 †

Andes—

Chilenische Refñihué-Expedition, von Dr. Paul Krüger, 585 †

Estudios de orografía Andina, por M. V. Ballivian, 584 †

Methods of Survey employed by the Chilean Boundary Commissions in the Cordillera of the, by Prof. A. Bertrand, 329 *

Profils géologiques transversaux de la Cordillere Argentino-Chilienne, par Dr. C. Burckhardt, 701 †

Andes—*continued*.

Southern: an Orographical Sketch, by Sir Martin Conway, 253 †

Andine region of Patagonia, 27

Andrée's buoy, discovery of, 481

Andréeff, M. N., Océan Arctique, 704 †

Angola—

Etudes sur les colonies portugaises, par Prof. H. Hauser, 699 †

Angra das Voltas, 645

Animals, Wild, in Africa, Preservation of, 105

Annandale, N., The Siamese Malay States, 698 †

Anniversary Meeting of the R.G.S., 115; Dinner, 117

Antarctic—

Animaux et plantes dans l'Antarctique, la vie des, par E. G. Racovitz, 492 †

Antarctic Regions, The, by Dr. K. Frieker, 586 †

Aufgaben der geplanten Südpolar Expeditionen, von Sir Clements R. Markham, 128 †

Aurora Australis or Polaris, 410

Belgian Expedition: Géographie physique de la région antarctique visitée par l'Expédition de la *Belgica*, par H. Arctowski, 492 †; Travaux scientifiques de l'Expédition antarctique belge, par G. Lecointe, 128 †, 492 †; Hydrographie dans le détroit de la *Belgica*, par G. Lecointe, 492 †; Expédition antarctique belge, 492 †

Deutsche Südpolar-Expedition, 255 †

Deutsche Tiefsee-Expedition auf dem *Valdivia* im südlichen Eismeer, von Dr. G. Schott, 491 †

Fossils, Notes on some, collected by Dr. Donald and Captain Larsen, by G. Sharman and E. T. Newton, 586 †

Fünfzehn Monate im südlichen Eismeer, von A. Stefan, 586 †

Geology and Physical Geography of, 400

Glaciers, Sur l'ancienne extension des, par H. Arctowski, 586 †

Ice Conditions in the, 401

International Co-operation in Antarctic Research, M. H. Arctowski on, 689

Magnetism of the, 408

Marine Floras of the Arctic and Antarctic, by Prof. D'Arcy Thompson, 587 †

Meteorology of the, 404

National Expedition, 98, 598; Prospects of the, 8

Rocks, Notes on some Specimens of, by Sir A. Geikie, 586 †

Scottish National Antarctic Expedition, The Proposed, 255 †

Southern Cross Expedition to the, 1899-1900, by C. E. Borchgrevink, 381 *, 569

Sydpolarforskningens nuvarande Ställning och mål, af Otto Nordenskjöld, 128 †

Antarctic—*continued*.

Through the First Antarctic Night, by F. A. Cook, 703 †

Zoology of, 402

Anthropogeography—

British New Guinea, Studies in the Anthropogeography of, by Prof. A. C. Haddon, 265 *, 414 *

Census-taking and its Limitations, by J. A. Baines, 131 †

Development of Habitable Lands, by H. R. Mill, 131 †

Homme et la Terre cultivée, par Jean Brunhes, 131 †

New Lands, by H. R. Mill, 568, 592 †

Primitive Nature Study, by A. F. Chamerlain, 590 †

Races et les Peuples de la Terre, par J. Deniker, 493 †

Anton, Dr. G. K., La régime foncier dans l'État indépendant du Congo, 580 †

Arabia—

Arabia: the Cradle of Islam, by Rev. S. M. Zwemer, 574 †

Southern Arabia, by Mr. and Mrs. Theodore Bent, review, 101

Ararat—

Besteigung des Ararat, von Dr. A. Oswald, 698 †

Ararat, Der, von Max Ebeling, 247 †

Arbo, C. O. E., Er der foregår nye invandringer i Norden? 120 †

Arc of the Meridian, Remeasurement of an, in Ecuador, 356

Arctic—

Abruzzi, Duca degli, Il ritorno della Spedizione polare di, 703 †

Andrée buoy, discovery of, 481

Andrée, Le sort de l'Expédition, par M. Zimmermann, 586 †

Crociera nel Mar Polare Artico, dal G. Schöck, 128 †

Estudios sobre las Regiones árticas, por D. José G. Sobral, 128 †

Expeditions: Baron Toll's Auxiliary Arctic Expedition, 567; Captain Bades and Captain Bauendal, 356; Duke of Abruzzi's, 480, 566; Lieut. Andrup's, 481

Marine Faunas of the Arctic and Antarctic, On a supposed resemblance between the, by Prof. D'Arcy Thompson, 587 †

Nansen and his Scientific Results, by E. Plumstead, 256 †

Nansen's 'Farthest North' Eclipsed, 703 †

Peary Expedition of 1900-1909; Peary's Work, Mr. H. L. Bridgman on, 492 †

Relics of Sir G. Nares' Expedition, 109

Windward. Voyage of the, 357, 566

Arctowski, Henryk, Award to, 116; Géographie physique de la région antarctique visitée par l'Expédition de la *Belgica*, 492 †; Notice sur les aurores australes, 257 †; Observations on the Aurora Australis, 92 *, 493 †; Sur

- l'ancienne extension des glaciers dans la région des terres découvertes par l'expédition antarctique belge, 586 †;
on International Co-operation in Antarctic Research, 689
- Argentine and Chili—**
Argentine-Chilian Boundary, Report, 701 †
Profils géologiques transversaux de la Cordillere Argentino-Chilienne, par Dr. C. Burckhardt, 701 †
- Argentine Republic—**
Agricultural and Commercial Condition of (Foreign Office Rep.), 584 †
Anuario de la Direccion General de Estadística, 490 †
Departamento Chemical, por G. Vallejo, 702 †
El Barco y Santiago del Estero, por S. A. Lafone Quevedo, 126 †
Etnologia en el Rio de la Plata, Progresos de la, por S. A. Lafone Quevedo, 126 †
Ferrocarriles proyectados en el Neuquen, por F. R. Cibils, 702 †
Inundaciones en el Rio Negro, Las, por E. Chanourdie, 702 †
La Plata - Länder, Geschichte der Eroberung und Besiedelung der, von Prof. J. Rein, 253 †
Llanura argentina, por D. E. A. Batio, 584 †
Maps: Railways of (Buenos Aires and Pacific Railway Co.), 709 †
Tehuelches et sur les indigènes de la République Argentine, par M. P. Moncousin, 253 †
- Argentine Republic and Uruguay—**
Allevamento del bestiamo e l'industria delle carni al Plata, del M. Garrou, 254 †
- Ark-e-leenik river, North Canada, 68**
- Armenia—**
Reisebriefe von der Armenischen Expedition der Dr. Belck und Dr. Lehmann, 579 †
Russisch Armenien und der Ararat, von Dr. Max Friederichsen, 248 †, 578 †
- Armstrong, —, Trade of Lombardy, 244 †**
- Army Medical Department, Report, 259 †**
- Arracan Expedition, 1825, The, 365 †**
- Artillery lake, North Canada, 70**
- Ashanti—**
Downfall of Prempeh, by Major-General R. S. S. Baden-Powell, 367 †
- Asia—**
After Wild Sheep in the Altai and Mongolia, by E. Demidoff, 696 †
Calcutta, Life of, as a seaport and the Mercantile Capital of Asia, letter from Major-General Forlong on, 238
Central: M. Bonin's journey in, 99;
Geographisch-wissenschaftlichen Ergebnisse meiner Reisen in Zentralasien, von Dr. Sven Hedin, 696 †;
Dr. Sven Hedin's journeys in, 472;

Asia—continued.

- Journeys in, by Captain H. H. P. Deasy, 141 *, 501 *; Northern China and the Nan Shan, Report of Expeditions, etc., by V. A. Obrucheff, 121 †;
Note sur les anciennes Chrétientés nestoriennes, par C. E. Bonin, 575 †;
Résultats . . . du voyage de M. M. Roborovsky et Kozlov, par J. Deniker, 247 †
- Central and Western, Etymology of a few towns of, by J. J. Modi, 485 †
- Eastern: Russische Arbeiten über Ostasien, von W. Barthold, 486 †;
Cyclones aux Philippines et dans les mers de Chine, par J. Algué, 486 †;
Ueber Bildungsstätten . . . der Orkane des "Fernen Ostens," von P. Bergholz, 122 †
- Journey of William of Rubruck to the Eastern Parts of the World, translated, etc., by W. W. Rockhill, 485 †
- Luftdruck und die atmosphärische Cirkulation in Asien, von A. Woeikof, 247 †
- Maps: Asie (Service Géo. de l'Armée), 136 †, 262 †
- Melbourne to Tokio, by W. Daish, 486 †
- Mittelmeer zum Persischen Golf, Vom, von Dr. Max von Oppenheim, 367 †
- Pamir-Expedition, Den anden danske, by Lieut. Olufsen, 366 †
- Phénicie et les Phéniciens, par E. Reclus, 124 †
- Photographs taken during journey from Quetta to Europe, by Captain Benn, 596 †
- Photographs taken in Mongolia and Russian Central Asia, by I. Morse, 380 †
- Russian Central: Countries and People, by A. R. Colquhoun, 248 †
- Russian Railways in, 223
- Tian Chan Russe, Dans le, par G. Saint-Yves, 123 †
- Travels in the East of Nicholas II., Emperor of Russia, by Prince E. Oukhtomsky, 575 †
- Western: Russische Arbeiten über Westasien, von W. Barthold, 579 †
- Asia Minor—**
Dr. Schaffer's expedition to, 556
Maps: Empire Ottoman, Division Administrative, par R. Huber, 708 †
- Asilli tribe, Abyssinia, 297, 298**
- Asphaltum (Philadelphia Museum), 591 †**
- Assam—**
Lac Industry of, Note on, by B. C. Basu, 365 †
Rail and River-borne Trade of, Returns of, 365 †
Report on the Administration of the Province of, 123 †
- Assyut, The Oases of the Mudirieh of, by A. R. Guest, 655 ***
- Astral Gravitation, Essays in illustration of the Action of, by W. L. Jordan, 706 †**

Astronomy—

Declination und Eigenbewegungen der Sterne für den Internationalen Breiten-
dienst, von Dr. F. Cohn, 587 †

How to calculate the lagna, by Prof. H. Jacobi, 703 †

Asturias, Spain, Devonian Iron Ores of, by J. A. Jones, 245 †

Atlantic Ocean—

Pilot Charts of the, 139 †, 500 †, 595 †, 712 †

Atlases—

Atlas Universel de Géographie, par M. Vivien de Saint Martin et F. Schra-
der, 711 †

Colonies Françaises, by P. Pelet, 379 †, 709 †

Historical Atlas of Modern Europe, by R. L. Poole, 377 †, 708 †

Historischer Schul-Atlas, von F. W. Putzger, 263 †

Phillips' London School Board Atlas, 710 †

Royal Atlas of Modern Geography, by W. & A. K. Johnston, 498 †

Times Atlas, 264 †

Atmosphere—

Thermodynamik der Atmosphaere, von W. von Bezold, 130 †

At To pass, Kwen Lun range, 506

Aurora—

Aurora Australis, Observations on the, by H. Arctowski, 92 *, 493 †

Aurora Australis and Borealis, Letter from Arthur Harvey on, 691-693

Aurora Australis or Polaris, description of, 410

Aurores australes observées pendant l'hivernage de l'expédition antarctique belge, par H. Arctowski, 257 †

Australasia—

Wragge's Australasian Almanac and Weather Guide for Land and Sea, 585 †

Australia—

Aborigines of, Rev. John Mathew on, 229

Cook's Voyage, Illustrations of the Botany of, by Sir J. Banks and Dr. D. Solander, 254 †

Currents in Australian Waters, Mr. H. C. Russell's observations on, 689

Federation of the Australian Colonies, Papers relating to the, 127 †

Maps: Route and Discoveries of the Calvert Exploring Expedition in Western Australia, by L. A. Wells, 379 †

Participation des Néerlandais à la découverte de l'Australie, par E. Janssens, 127 †

Quiros and the Discovery of, Cardinal Moran on, 479

South: Divisions of the South Australian Aborigines, by R. H. Mathews, 373 †; Fossil Remains of Lake Callabonna, by E. C. Stirling and A. H. C. Zietz, 128 †

Australia—continued.

Western: Native tribes of, by R. H. Mathews, 373 †; Western Australia in 1899, by Hon. E. H. Wittenoom, 128 †; Year-Book for, by M. A. C. Fraser, 586 †

Year-Book of, edited by the Hon. E. Greville, 254 †

Austria—

Enneberg in seinen wirthschaftlichen und socialen Verhältnissen, von Dr. J. Alton, 242 †

Entwicklung des slavischen Speichers, von Karl Rhamm, 119 †

Lingue in Austria, La Questione delle, del C. V. A. Gonzaga, 242 †

Meteorologie und Erdmagnetismus, Jahrbücher der k.k. Central-Anstalt für, 119 †

Railways of, Extent of, 221

Austria-Hungary—

Astronomischen Gradmessungsarbeiten des k. u. k. militär-geographischen Institutes, von F. Netuschill, 483 †

Eastern Trade with, Dr. W. Schwaighofer on, 553

Gletscher der Mur und Mürz, von Dr. A. Böhm, 483

Hypsometrische Karte von Oesterreich-Ungarn, 261 †

Lothungen im Hallstätter See, Bemerkungen über alte und neue, von Dr. A. Penck, 483 †

Präcisions-Nivellement in der österreichisch-ungarischen Monarchie, von F. Lehl, 483 †

Trade of (Foreign Office Rep.), 569 †

Austrian Explorations in the Solomon Islands, 230

Avalanches—

Grundlawinenstudien, von F. W. Sprecher, 588 †

Azimuth Tables—

Star's true bearing or Azimuth Tables, by P. L. H. Davis, 492 †

Sun's true bearing or Azimuth Tables, by P. L. H. Davis, 492 †

B.

BACON, Rev. J. M., Fogs and their Teaching, 257 †

Bacteria, especially as they are related to the economy of nature, etc., by George Newman, 706 †

Baddeley, M. J. B., Thorough Guide Series, English Lake District, 365 †; Scotland, Part I., 364 †

Bade, Captain, Arctic Expedition of, 356

Baden-Powell, B. H., The Village of Goa in the Early Sixteenth Century, 123 †

Baden-Powell, Major-General R. S. S., The Downfall of Prempeh, 367 †; The Matabele Campaign, 249 †

Badjan-Dara, Shugnan, 676

- Baedeker, Karl, Handbook for Travellers, Northern Germany, 484 †; London and its Environs, 574 †; Paris and Environs, with Routes from London to Paris, 361 †; The Rhine from Rotterdam to Constance, 365 †
 Baghdad, Trade of (Foreign Office Rep.), 698 †
 Bahia, Trade of (Foreign Office Rep.), 584 †
 Baillaud, E., explorations on the Niger, 227; Les territoires français du Niger, leur valeur économique, 488 †; note on, 477
 Baines, J. A., On Census-taking and its Limitations, 131 †; The Industrial Development of India, 365 †
 Baker channel, Patagonia, 204
 Baker, F. C., The Mollusca of the Chicago Area, 583 †
 Baker lake, North Canada, 67
 Baker, Marcus, The Anglo-Venezuelan Boundary Dispute, 254 †
 Bako, town of, South Abyssinia, 558
 Bala, Lake, North Wales, 679
 Balch, E. S., Glacières or Freezing Caverns, 373 †
 Baldacci, Dr. A., Itinerari albanesi, 574 †
 Balik Papan bay, East Borneo, 474
 Balkans—
 Frage der Vergletscherung des Central-Balkan, von Dr. W. Götz, 569 †
 Morphologische und glaciële Studien aus Bosnien, der Hercegovina und Montenegro, von Dr. J. Cvijić, 483 †
 Période glaciële dans la péninsule des Balkans, par M. J. Cvijić, 483 †
 Ballantine, Mr., journey in British New Guinea, 107
 Balleny island, Antarctic, 382
 Ballivian, M. V., Estudios de orografia Andina, 584 †; y B. Saavedra, El Estañio en Bolivia seguido de un Apéndice y de Apuntes sobre el bismuto, 584 †
 Ballore, F. de Montessus de, Description sismique de l'Empire Russe, 694 †
 Baltic—
 Mittelwasser der Ostsee bei Travemünde, etc., von Dr. A. Westphal, 484 †
 Waterway from the, to the Black Sea, Mr. Woodhouse on the, 555
 Baluchistan and Afghanistan, An Orographic Map of, by Sir T. Holdich, 527 *
 Banda island and sea, 111, 550, 551
 Bandar Abbas, Persian Gulf, 211
 Banks, Sir J., and Dr. D. Solander, Illustrations of the Botany of Captain Cook's Voyage Round the World, 254 †
 Baram district, Borneo, 39, 53
 Baratta, M., Sullo stato presente dei vulcani eolici, 572 †
 Barbadoes, Report for 1899 (Colonial Rep.), 702 †
 Barbour, E. H., Glacial Grooves & Striae in South-Eastern Nebraska, 584 †
 Barcelona, Trade of (Foreign Office Rep.), 694 †
 Baring-Gould, Edith, With *Note-book and Camera, 707 †
 Barnes et Holroyd, MM., La Blue-John-Mine à Castleton (Angleterre), 695 †
 Baro river, Sobat basin, 476
 Baroda district, Abyssinia, 297
 Barometer—
 Ein neues Barometer, von Dr. K. T. Fischer, 493 †
 Barré, P., La Chine entr'ouverte, 122 †; Djibouti et Obock, 367 †
 Barrett, R. L., The Sundal Drainage System in Central Norway, 572 †
 Barrows, D. P., The Colorado Desert, 582 †
 Barthold, W., Russische Arbeiten über Ostasien, 486 †; Russische Arbeiten über Westasien, 579 †
 Bartholomew, J., Commercial Map of South America, 263 †; Special Map of China, Japan, and Korea, 262 †; Reduced Ordnance Survey of England and Wales, 134 †, 708 †; Reduced Ordnance Survey of Ireland, 262 †
 Baschin, O., Bibliotheca Geographica, 706 †; Die Entstehung der Dünen, 704 †
 Bastard, G., Une ville du Niger, Dienné, 250 †
 Bastion mountains, Patagonia, 36
 Basu, B. C., Note on the Lac Industry of Assam, 365 †
 Basutoland—
 Expedition to the Mont Aux Sources, by T. L. Fairclough, 124 †
 Report for 1898 (Col. Reports), 124 †
 Batavia—
 Map: Topographische Kaart der Residentie Batavia (Netherlands Government), 137 †
 Batoum and District, Trade of (Foreign Office Rep.), 366 †
 Batu Lawei peak, Borneo, 39
 Bauendal, Captain, Arctic Expedition of, 356
 Baumann, Dr. Oskar, von Dr. M. Haberlandt, 494 †
 Baumstark, Lieut., Die Warangi, 250 †
 Bavaria—
 Trade, Agriculture, and Finances of (Foreign Office Rep.), 570 †
 Bavio, D. E. A., La Llanura argentina, 584 †
 Baxendell, J., The Fernley Observatory, Southport, Report, etc., 246 †
 Baye, Baron de, En nouvelle Russie, 363 †
 Beach Cusps, The Origin of, By J. C. Branner, 704 †
 Bear island—
 Oberdevonische Flora der Bären Insel, von A. G. Nathorst, 586 †
 Beazley, C. R., New Light on some Mediaeval Maps, 319 *, 375 †, 705
 Behaim's account of Diogo Cão's second voyage, 633

- Behrens, Dr. W., Am Nordrande der Sahara, 251 †
- Beira, Trade of (Foreign Office Rep.), 369 †, 581 †; note on, 351
- Beirut and Coast of Syria, Trade of (Foreign Office Rep.), 579 †
- Belek, Dr. W., und Dr. C. Lehmann, Reisebriefe von der Armenischen Expedition der, 579 †
- Bell, C. N., Macquarie Harbour, 586 †
- Bell, Dr. R., The Geological History of Lake Superior, 582 †
- Benadir coast of Somaliland, 104
- Benest, H., Fleuves sous-marins, 704 †
- Bengazi, Trade of (Foreign Office Rep.), 700 †
- Benham, —, Trade of Italy, 244 †
- Benn, Captain R. A. E., Photographs taken during Journey from Quetta to Europe, 596 †
- Ben Nevis, Meteorology of, in clear and foggy weather, by J. Y. Buchanan, 695 †
- Bennigsen, Herr v., Reise zum Zwecke der Uebernahme des Inselgebietes der Karolinen, Palau und Marianen, 127 †; visit to the North Coast of New Britain, 565
- Bent, Mr. and Mrs. Theodore, Southern Arabia, review, 101
- Bentley, Rev. W. H., Pioneering on the Congo, 367 †
- Berg, A., Litteraturbericht zur Landes- und Volkskunde Thüringens, 243 †
- Bergamo Alps—
Guida-Itinerario alle Prealpi Bergamasche, by M. Hoeppli, 362 †
- Bergholz, P., Ueber Bildungstätten . . . der Orkane des "Fernen Ostens," 122 †
- Bergmann, Dr. K., Die Volksdichte der Hessischen Provinz Starkenburg, 243 †
- Bering Sea—
Ice and Ice Movements in, by J. Page, 373 †; note on, 110
- Bermuda—
Geology of the Bermudas, Notes on the, by A. E. Verrill, 125 †
- Bernal, —, Trade of Pomerania, 243 †
- Bertacchi, C., L'Italia e il suo Mare, 704 †
- Bertolini, Prof. G. L., Della linea e dei fiumi di resorgiva in relazione al territorio veneto, 572 †
- Bertrand, Marcel, Déformation tétraédrique de la Terre, 130 †; New Geomorphological Theory of, 232
- Bertrand, Prof. A., Methods of Survey employed by the Chilean Boundary Commission in the Cordillera of the Andes, 329 †, 704 †; remarks on "The Patagonian Cordillera and its Main Rivers," 210
- Berzeviczy, G. F. von, von S. Weber, 590 †
- Betz, Dr. H., Ein Ausflug nach den Yangtze-Grotten, 486 †
- Bevan, T. F., Did De Quiros land in Queensland? 494 †, 479
- Bezold, W. von, Zur Thermodynamik der Atmosphäre, 130 †
- Bibliography—
Americana, Iles Philippines, 590 †
- Neuvième Bibliographie Géographique Annuelle, par L. Raveneau, 591 †
- Société de Géographie de Lille, Liste des Conférenciers, par E. Cantineau, 591 †
- Bibliotheca Geographica, von O. Baschin, 706 †
- Bigelow, F. H., Work of the Meteorologist for the Benefit of Agriculture, Commerce, and Navigation, 584 †
- Big Game—
Sette Anni di Caccia Grossa e Note di Viaggio in America, Asia, etc., by F. Scheibler, 133 †
- Bilbao and District, Trade of (Foreign Office Rep.), 695 †
- Biography—
Dictionary of National Biography, edited by Sidney Lee, 132 †, 494 †
- Geographische Nekrologie für die Jahre 1898 und 1899, von Prof. Dr. W. Wolkenhauer, 132 †
- Biology—
New Creatures for Old Countries, 493 †
- Birdwood, Sir George, Etymology of Africa and Ophir, 134 †
- Bishop, Mrs. J. F., The Art of Travelling, 592 †
- Bizerta—
Bizerte, Les souvenirs du passé, par R. Castaing, 700 †
- Blanchet, M., Expedition to Adrar, 227, 683
- Bleicher, M., Sur la dénudation de l'ensemble du plateau lorrain, etc., 243 †
- Blücher mountains, New Guinea, 269
- Bludau, A., Erdumrisskarte in flächentreuer Planisphäre, 187 †
- Blumentritt, F., Die Igorroten von Pangasinan, 578 †
- Blundell, H. W., A Journey through Abyssinia to the Nile, 124 †
- Blunt, G., General Intelligence Papers, 375 †
- Boddy, Rev. A. A., From the Egyptian Ramleh, 124; † Days in Galilee and Scenes in Judæa, 698 †
- Boegner et Germond, M. M., Rapport sur la Délégation à Madagascar, 581 †
- Boers—
Premiers Boers, Les, par E. Fournier de Flaix, 125 †
- Bogdanovich, M., Expedition to Okhotsk and Kamchatka, 222
- Bohemia, North-West, German and Czech in, Dr. J. Zemmrich on, 553
- Böhm, Dr. A., Die alten Gletscher der Mur und Mürz, 483 †
- Bohn, F., Le développement économique de nos Colonies de l'Afrique occidentale, 368 †
- Bokhara, by W. R. Rickmers, 366 †; A Journey through the Khanate of Bokhara, by Mrs. Rickmer Rickmers, 248 †

- Boldt, R., Ortbeskrifningen i Finland på 16- och 1700-talen, 245 †
- Bolivia—
 Cordillera Real of Bolivia, Notes on a Map of Part of the, by Sir Martin Conway, 126 †
 Eastern: M. Cercean's Explorations in, 564
 Estafío en Bolivia seguido de un Apéndice y de Apuntes sobre el bismuto, por M. V. Ballivian y B. Saavedra, 584 †
 Memoria que presenta el Secretario General de Estado a la Convencion Nacional, 126 †
 Road to Bolivia, by W. E. Curtis, 490 †
 Southern: Railway Project in, 565
 Bonaventure, Pére, L'Islande, 571 †
- Bonchamps, M., Résultats géographiques de la mission de, par C. Michel, 580 †; note on, 476
- Bonin, C. E., journey in Central Asia, 99; Note sur les anciennes Chrétientés nestoriennes de l'Asie Centrale, 575 †
- Bonney, Prof. T. G., Colonel Feilden's Contributions to Glacial Geography, 495 †
- Bonnier, G., Remarques sur les variations des limites de la région méditerranéenne, 245 †
- Boran highlands, East Africa, 604
- Borchgrevink, C. E., The *Southern Cross* Expedition to the Antarctic, 381*, 569; map of South Victoria Land, note on, 567
- Bordeaux—
 Bordeaux et l'esprit Colonial, par M. P. Foncin, 243 †
 Trade of (Foreign Office Rep.), 243 †
- Bordeaux Geographical Society—
 Vingt-cinq années de la Société de géographie commerciale de Bordeaux, par M. J. Manés, 259 †
- Borelli, G., Le Dahomé, ressources économiques et avenir commercial, 368 †
- Börger, Dr. C., Ueber die Auflösung des Zweihöhen-Problems nach einer Näherungsmethode von Raper, 256 †
- Borisoff, Lient., expedition to Novaya Zemlya, 689
- Borneo—
 Balik Papan, Bay of, Mr. H. Richards' account of, 474
 Brunei and Sarawak, Trade of (Foreign Office Rep.), 697 †
 Handelsverhältnisse auf Borneo und in Niederländisch-Indien, von Dr. H. Breitenstein, 697 †
 In the Heart of, by Ch. Hose, 39*, 578 †
 Tweede reis van Pontianak naar Samarinda, door Dr. A. W. Nieuwenhuis, 366 †
- Borneo and Java—
 21 Jahre in Indien, Erster Theil: Borneo, Zweiter Theil, Java, von Dr. H. Breitenstein, 697 †
- Bosnia and Hercegovina—
 Morphologische und glacielle Studien aus Bosnien und Hercegovina, von Dr. J. Cvijić, 483 †
 Reisebilder aus Bosnien und der Hercegovina, von Dr. M. Bräss, 483 †
- Boston—
 Trade of (Foreign Office Rep.), 583 †
- Bosworth, G. F., Philips' County Readers: Kent, Past and Present, 695 †
- Botanical Geography—
 Géographie botanique et son évolution au XIX^e siècle, par M. A. Masclef, 493 †
- Boussinesq, J., Problème du refroidissement de la croûte terrestre, 373 †
- Bower, T. B., Large-scale Map of the Southern Transvaal and Northern Orange River Colony, 709 †
- Bowes, Alderman L., Barrage of the Nile, 488 †
- Bracq, Prof. J. C., The Colonial Expansion of France, 376 †
- Brady, —, Report on Alaska, 701 †
- Brahmaputra—
 Wild Tribes of the Brahmaputra Valley, Physical Types . . . of the, by Major L. A. Waddell, 247 †
- Branner, J. C., Ants as Geologic Agents in the Tropics, 126 †; The Origin of Beach Cusps, 704 †
- Bräss, Dr. Martin, Reisebilder aus Bosnien und der Hercegovina, 483 †
- Brazil—
 Ants as Geologic Agents in the Tropics, by J. C. Branner, 126 †
 Ceará et Amazonie, par D. Guilmot, 127 †
 Italiani nel sud dello Stato di Sta. Caterina, del G. Pio di Savoia, 372 †
 Minas Geraes nel Brasile, Lo stato di del E. Negri, 127 †
 Revista comemorativa do Quarto Centenario do Brazil, 490 †
 Voyage au Trombetas, par O. Condreau, 490 †
- Breitenstein, Dr. H., Die Handelsverhältnisse auf Borneo und in Niederländisch-Indien, 697 †; 21 Jahre in Indien, 697
- Bremer, O., Ethnographie der germanischen Stämme, 484 †
- Brenkelman, J. B., De beslissing in het Britisch Venezuelaansch Grensgeschied, 127 †
- Bretschneider, Dr. E., Potanins letzte Reise in West-China, 122 †; The Russian Territory in the Liao-tung Peninsula, 486 †
- Brick, Dr. C., Die Provinz Westpreussen und ihre Naturdenkmäler, 485 †
- Bridgman, H. L., on Peary's Work, 492 †
- Bright, Major R. G. T., remarks on "An Expedition between Lake Rudolf and the Nile," 624
- Brincker, P. H., Die Eingeborenen Deutsch-Südwest-Afrikas nach Geschichte, Charakter, etc., 488 †

- British Agreement with Tonga, 108
 British Association, Bradford, Proceedings of, 441; Address to the Geographical Section of the, by Sir G. S. Robertson, 447 *
 British Colonies—
 Statistical Tables relating to the Colonial and other Possessions of the United Kingdom, 133 †
 British Columbia—
 Glaciers in, Additional Observations on, by G. and W. Vaux, 252 †; note on, 687
 Illicilliwaet, Great Glacier of the, by George and W. S. Vaux, 125 †
 Mining Districts near Kamloops Lake, by G. F. Monekton, 125 †
 British Guiana and Venezuela—
 Britisch Venezuelaansch Grensgeschil, door Mr. J. B. Brenkelman, 127 †
 British Islands: *see* United Kingdom
 Brittlebank, C. C., The Rate of Erosion of some River Valleys, 589 †
 Broden, Dr. A., De l'influence des températures élevées sur l'organisme humain, 591 †; La Malaria d'après les dernières recherches des Italiens, 134 †
 Brosch, G. R. von, Prof. Dr. Nansen und Payer's Karte von Franz Josef-Land, 128 †; on Payer's Map of Franz Josef Land, 109
 Brose, M., Die deutsche Kolonialliteratur im Jahre 1898, 260 †
 Bruce, W. S., Proposed Scottish National Antarctic Expedition, 255 †; Spitsbergen 1898 and 1899, 587 †
 Brückner, Dr. E., Die Schweizerische Landschaft einst und jetzt, 573 †
 Brunhes, Jean, L'Homme et la Terre cultivée, 131 †
 Bruun, D., Arkæologiske Undersøgelser paa Island, 244 †
 Buchan, Dr. A., The Annual Rainfall of Scotland from 1800 to 1898, 364; Tidal Currents of the North Sea, 704 †
 Buchanan, J. Y., The Meteorology of Ben Nevis in Clear and Foggy Weather, 695 †
 Buchenstein Valley, Wedges of lower and middle Trias above the Plane of Overthrust in, 462
 Buchet, G., Planktonmètre pour pêches pélagiques à grande vitesse, 374 †
 Buddhist Monastery at Sohnag, by V. A. Smith, 487 †
 Buenos Ayres—
 Annuaire statistique de la ville de, 702 †
 Trade of Consular District of (Foreign Office Rep.), 584 †
 Bulgaria—
 Trade of (Foreign Office Rep.), 570 †
 Bülow, W. V., Die Namen der Samoa-Inseln, 491 †
 Burkhardt, Dr. C., Profils géologiques transversaux de la Cordillere Argentino-Chilienne, 701 †
 Burma—
 Arracan Expedition, 1825..365 †
 Burma, by Max and Bertha Ferrars, 365 †
 Burmah-China Railway, by W. Sherriff, 696 †
 Burma-Sechuan Railway, Captain E. C. Pottinger's surveys for the, 680, 681
 Geology of the Country along the Mandalay-Kunlon Ferry Railway route, by P. N. Dutta, 577 †
 Tables for the Transliteration of Shan Names into English, 696 †
 Bussorah, Trade of (Foreign Office Rep.), 367 †
 C.
 CABLES—
 Projets de Cables, Les, par M. G. Demanche, 131 †
 Cabot—
 El "Sebastian Gaboto" de Henry Harrisse, por S. A. Lafone Quevedo, 131 †
 Cagayan Sulu and Sibutu islands, Cession of, to the United States, 683
 Caix, R. de, La marche vers le Tonât, 251 †
 Calbuco volcano, Patagonia, 33
 Calcutta as a Seaport, The Life of, letter from Major-General J. G. R. Forlong on, 238
 California—
 Alpine Glaciers of the Sierra Costa Mountains in, by O. H. Hershey, 252 †
 Basse-Californie d'après M. L. Diguët, 371 †
 Earthquakes in, by C. D. Perrine, 490 †
 International Competition for the Phœbe Hearst Architectural Plan for the University of California, 133 †
 Calvert, Ed., Gaping Ghyll Hole, 246 †
 Cameroons—
 Southern, Baron von Stein's surveys in the, 562
 Campbell, Dr. John, Decipherment of the Hieroglyphic Inscriptions of Central America, 585 †
 Camperio, Manfredo (Biography), 132 †; par Dr. E. Schweinfurth, 590 †
 Canada—
 Chesterfield Inlet to Great Slave Lake, Journey from, by David T. Hanbury, 63 *, 479, 489 †
 Ethnological Survey of, Report of the Committee, 252 †
 Geological Survey of: Catalogue of Canadian Birds, by J. Macoun, 370 †; Preliminary Report on the Klondyke Gold Fields, by R. G. McConnell, 370 †; Summary Report of the, 489 †
 Historical Publications relating to, edited by Prof. G. M. Wrong and H. H. Langton, 252 †
 Interior, Department of the, Annual Report, 582 †; note on, 563

Canada—continued.

- Iroquois Beach, The, by Prof. A. P. Coleman, 582 †
 Maps: Sectional Map of, 379 †
 Minerals of Canada, Descriptive Catalogue of a Collection of the, in the Paris Exhibition, 582 †; Economic Minerals, Paris International Exhibition, by G. M. Dawson, 489 †
 Photographs of the North-West Territories of, by D. T. Hanbury, 139 †
 Surveys and Museums, by B. E. Walker, 489 †
 Tides and Currents in Canadian Waters, Survey of, by W. Bell Dawson, 582 †
 Voyages au Canada du Baron de La Hontan, par F. de Nion, 489 †
 Yukon River in Canada, The Basin of the, by J. B. Tyrell, 370 †
 Canada and the United States, Relief Map of (Geological Survey of Canada), 137 †
 Canary Islands, Trade of the (Foreign Office Rep.), 488 †
 Cantineau, E., Société de Géographie de Lille, Liste des Conférenciers, 591 †
 Cao, Diogo, and Bartholomeu Dias, Voyages of, 1482-88.. 625 *; Appendix on the Maps illustrating the, 649; List of Place-names, 651
 Cape Colony—
 Cape National Forests, by D. E. Hutchins, 367 †
 Cape of Good Hope, Report of Her Majesty's Astronomer at the, 474, 488 †
 Cape to Cairo, *Daily Telegraph* Expedition from, 351, 558
 Capenny, S. H. F., An Indo-European Highway, 575 †
 Caperon, M., Sainte-Pierre et Miquelon, 701 †
 Caracas & District, Trade of (Foreign Office Rep.), 702 †
 Charles, W. R., The Grand Canal of China, 247 †
 Carlheim-Gyllensköld, V., Die Aufgabe der modernen Geodäsie, 129 †; Travaux de l'expédition suédoise au Spitzbergen, 256 †
 Carmichael and Tomassini, Trade of Leghorn and Ancona, 244 †
 Carne, J. E., Mercury or "Quicksilver" in New South Wales, 491 †
 Carolina, South, Trade and Industry of, Report on, 354
 Caroline Islands—
 Núkuoro oder Monteverde-Inseln (Karolinen), von J. Kubary, 491 †
 Reise zum Zwecke der Uebnahme des Inselgebietes der Karolinen, Palau und Marianen, von Bennigsen, 127 †
 Carter, Prof. O. C. S., Coastal Topography of the United States, 126 †
 Cartography—
 Bevölkerungstatistische Grundkarten, von Prof. Dr. A. Hettner, 129 †
 Cartography of the Terra Australis and New Holland, by J. B. Walker, 590 †

Cartography—continued.

- Eisenbahnnetzes, Berechnung der Dichte des, von Dr. L. Henkel, 129 †
 Foreign Topographic Maps, by Colonel Sir John Farquharson, 129 †
 Notice Historique succincte sur la Cartographie, par M. A. Lejeaux, 587 †
 Proiezioni cartografiche cicloidali, Nota di M. Fiorini, 129 †
 Table des Légendes latines, hollandaises et italiennes d'un Atlas Ancien contenant des Cartes hydrographiques, etc., 492 †
 Ueber Historische Grundkarten, von K. Lamprecht und R. Kötzschke, 492 †
 Unechtcylindrische und unechtkonische flächentreue Abbildungen, von Prof. Dr. E. Hammer, 129 †
 War Maps, by Colonel Sir T. H. Holdich, 492 †
 Casablanca, Bearbeitet nach dem Reisebericht S.M.S. *Charlotte*, 369 †
 Castaing, R., Bizerte: Les souvenirs du passé, 700 †
 Castello de S. Jorge da Mina, 626
 Catalogue—
 Inventaire Sommaire des Archives historiques, Ministère de la Guerre, 133 †
 Caucasus, Railway in, 224
 Caucasus—
 Batumi and District, Trade of (Foreign Office Rep.), 366 †
 Pflanzenverbreitung in den Kaukasusländern, von Dr. Gustav Radde, 123 †
 Sammlungen des Kaukasischen Museums, von Dr. G. Radde, 366 †
 Celebes sea, depths of the, 551
 Census-taking and its Limitations, On, by J. A. Baines, 131 †
 Cerceau, M., explorations in Eastern Bolivia, 564
 Ceylon—
 Anurádhapura sous les rois éinghalais, par J. Leclercq, 575 †
 Sejour dans l'île de Ceylan, par J. Leclercq, 696 †
 Chaco Boreal, the Land and the People, by W. B. Grubb, 491 †
 Chad, Lake—
 Autour de lac Tchad, 582 †
 French Explorations in the Region of, 349
 M. Foureau's route round, 557
 Chaix, Paul, Marco Polo, 494 †
 Chamberlain, A. F., Primitive Nature Study, 590 †
 Chamberlin, Prof. T. C., An attempt to test the Nebular Hypothesis by the relations of masses and moments, 129 †
 Chamonix and the Range of Mont Blanc, by Ed. Whympier, 119 †
 Champlain, Samuel, Vie de, par G. Gravier, 494 †
 Chanourdie, E., Las Inundaciones en el Rio Negro, 702 †
 Charleston and District, Trade of (Foreign Office Rep.), 253 †; note on, 354

- Charts, New—
 Admiralty, 138, 499, 711
 Cancelled, 139, 499, 711
 Corrected, 139, 499, 712
 United States Hydrographic, 139, 264, 500, 595, 712
- Chatelier, A. Le, Le Bassin minier du Niari, 580 †
- Chattanooga District, Physiography of the, by C. W. Hayes, 371 †
- Chefoo, Trade of (Foreign Office Rep.), 576 †
- Chekiang—
 Escursione nel Ce-kiang settentrionale, del L. Vannutelli, 486 †
- Chesterfield Inlet to Great Slave Lake, A Journey from, by D. T. Hanbury, 63 *, 479, 489 †
- Che-tang plain, Sechuen, 582
- Chevalier, Père, geographical work of, in China, 556
- Chewings, Hannah, Amongst Tropical Islands, 491 †
- Chicago—
 Mollusca of the Chicago Area, The Pelecypoda, by F. C. Baker, 583 †
 Trade of (Foreign Office Rep.), 253 †
- Chile—
 Chilenische Refühue-Expedition, von Dr. Paul Krüger, 372 †
 Departement Taltal, von L. Darapsky, 702 †
 Ferrocarriles de Chile, por J. V. Jiménez, 585 †
 Spanish explorations in, 15
 Trade of (Foreign Office Rep.), 585 †
- Chilean Boundary Commissions in the Cordillera of the Andes, Methods of Survey employed by the, by Prof. A. Bertrand, 329 *
- Chi-li, Province of, Short Military Report on the, 486 †
- Chiloe island, South America, 16
- China—
 A Sárkányok Országából, by M. Cholnoky, 575 †
 Anthropologie des Chinois du Nord, Notes sur l', par J. de Talko-Hryniewicz, 122 †
 Aufstand der Boxer, von H. Feigl, 575 †
 Bevölkerungsfrage Chinas, Kritische Studien zur, von E. M. Köhler, 122 †
 Chemin de fer de Peking à Nieoutchouang, par M. A. Fauvel, 486 †
 Chi-li province, Short Military Report on the, 486 †
 China and Her People, by Commander H. Webster, 575 †
 China and the Present Crisis, by J. Walton, 696 †
 China, the Long-lived Empire, by Eliza R. Scidmore, 486 †
 Chine entr'ouverte, par Paul Barré, 122 †
 Chine d'après des auteurs récents, par G. de Leval, 122 †
 Chine qui s'ouvre, par R. Pinon, 486 †
- China—continued.
 Fleuve Bleu de Sui-fou à la hauteur de Tali-fou, par le Vicomte de Vaulserre, 247 †
 French Jesuits, Geographical Work of the, in China, 556
 Géographie générale des provinces Chinoises voisines du Tonkin, par M. A. Leclère, 122 †
 Gordon's Campaign in China, by Himself, with Introduction, etc., by Colonel Vetch, 576 †
 Grand Canal of, by W. R. Carles, 247 †
 Imperial Maritime Customs, Medical Reports, 576 †
 Küstenkunde von China, Zur, von Kapt. Lans, 486 †
 Maps: Atlas de l'Empire Chinois, par C. Madrolle, 262 †; W. & A. K. Johnston's Map to illustrate the Chinese Question, 378 †; Imperial Railways of North China, by C. W. Kinder, 378 †; Nordöstlichen China, von F. v. Richthofen, 708 †; Théâtre des Opérations en Chine, Environs de Peking (Service Geo. de l'Armée), 594 †
 "Overland" to China, The, by A. R. Colquhoun, 485 †
 Peking nach Ch'ang-an und Lo-yang, Vom, von A. Forke, 486 †
 Population of, Herr E. M. Köhler's estimate of, 100
 Potanins letzte Reise in West-China, von Dr. E. Bretschneider, 122 †
 Problem in China and British Policy, by A. R. Colquhoun, 485 †
 Problems in China, by J. M. Hubbard, 575 †
 Railway Surveys in, 345
 Resources of, Development of the, Mr. G. Chisholm on, 445
 San-tou-ao, Le nouveau port de, par M. A. Fauvel, 247 †
 Sphères d'influence en Chine, 575 †
 "Things Chinese," by Captain W. A. S. Wingate, 122 †
 Western China, A Recent Survey in, by Captain E. C. Pottinger, 575 †
 Yangtse Valley and Sechuan, Photographs of the, by R. L. Jack, 500 †
 Zi-ka-wei, Mission de, L'œuvre géographique de la, par A. A. Fauvel, 575 †; note on, 556
- China, Japan, and Korea—
 Bartholomew's Special Map of, 262 †
 Stanford's Map of, 378 †
- China Seas—
 En Croisière: Deux ans dans les mers de Chine, 576 †
- Chinde, Trade of (Foreign Office Rep.), 581 †
- Chinkiang, Trade of (Foreign Office Rep.), 576 †
- Chiperoni, Central Africa, 166
- Chisholm, G. G., on the Development of the Resources of China by modern methods, 445

- Cholnoky, M., A Sárkányok Országából, 575 †
- Christiansen, Cape, East Greenland, 664
- Christy, Miller, The Silver Map of the World, review, 113
- "Chronometer" Tables, by P. L. H. Davis, 587 †
- Church Missionary Society, Proceedings of the, for Africa and the East, 495 †
- Cibils, F. R., Ferrocarriles proyectados en el Neuquen, 702 †
- Cisneros, C. B., and R. E. Garcia, El Perú en Europa, 491 †
- Cisnes river, Patagonia, 198
- Ciudad Bolívar, Trade of (Foreign Office Rep.), 254 †
- Claparède, A. de, Corfou et les Corfiotes, 361 †; Les Reliefs Perron, 703 †
- Classical Maps—
Murray's Handy Classical Maps, edited by G. B. Grundy, 134 †, 234
- Clements, J. M., and H. L. Smyth, The Crystal Falls Iron-bearing District of Michigan, 371 †, 583 †
- Cleve, P. T., On the Origin of "Gulf Stream Water," 130 †; On the Seasonal Distribution of some Atlantic Plankton-organisms, 130 †
- Climatological Maps—
Methode zur Berechnung klimatologischer Mittelwerthe von Flächen, von Dr. W. Meinardus, 493 †
- Climatology—
Climat des Hauteurs de l'Europe occidentale, par A. Woeikof, 257 †
Comparative Studies in Climate, Prof. Hildebrandsson on, 234
- Clinton Golden Lake, North Canada, 70
- Coast-dwellers—
Kustfolks olika sjoduglighet, af H. H. von Schwerin, 375 †
- Cochamo valley, Patagonia, 35
- Codrington, Robert, award to, 117; A Journey from Fort Jameson to Old Chitambo and the Tanganyika Plateau, 124 †
- Cœtlogon, —, Trade of Charleston and District, 253 †
- Cohn, Dr. F., Ableitung der Declinationen und Eigenbewegungen der Sterne für den Internationalen Breitendienst, 587 †; Geographische Ortbestimmungen von Dr. Kersting im Hinterlande von Togo, 368 †
- Coleman, Prof. A. P., The Iroquois Beach, 582 †
- Coles, John, award to, 99; retirement of, 2
- Colin, P., Positions géographiques . . . sur la côte orientale de Madagascar, 368 †
- Collection of Insects, etc., made in Somaliland by C. V. A. Peel, 370 †
- Colombia and Costa Rica, The Boundary between, 564
- Colonial Publication, New, 358
- Colorado—
Life on the Colorado Plateaus, by R. Dodge, 252 †
- Colorado Desert, The, by D. P. Barrows, 582
- Colquhoun, A. R., Afghanistan: the key to India, 246 †, 485 †; The "Overland" to China, 485 †; The Problem in China and British Policy, 485 †; Russian Central Asia: Countries and People, 248 †; The Renaissance of South Africa, 700 †
- Comoro Group—
Notice sur Mayotte et les Comores, par E. Vienne, 699 †
- Compass—
Appunti storici intorno all' uso topografico ed astronomico della bussola, del P. T. Bertelli, 259 †
- Congo—
Bend of the Congo, M. Rue's Explorations within the, 562
- Bilans Congolais, par A. Poskin, 249 †
- Cão's voyage to the, 629 †
- Currents of the mouth of, Commander Purey-Cust on, 349
- Expédition aux sources du, par Capt. Lemaire, 249 †
- Expedition to the Mouth of the Congo, under Captain Lemaire, 684
- Frontier, Congo-German, in the Kivu Region, 105
- French: La Mission Fourneau, 250 †; Le problème du Wam, par A. J. Wauters, 250 †; Les sources du Chari, 251 †; Organization of, 684
- Léopoldville am Stanley Pool, Die Entwicklung von, 699 †
- Padrão of St. Jorge erected by Cão, 630
- Pioneering on the Congo, by Rev. W. H. Bentley, 367 †
- Régime foncier dans l'État Indépendant du Congo, par Dr. Anton, 580 †
- Région des bas-fonds de l'ancienne mer intérieure du haut Congo, 367 †
- Sources du, par A. J. Wauters, 580 †
- Telegraph on the, progress of the, 229
- Conway, Sir Martin, Hudson's Voyage to Spitsbergen in 1607..256 †; Notes on a Map of Part of the Cordillera Real of Bolivia, 126 †; remarks on "Methods of Survey employed by the Chilean Boundary Commissions," 344; Some unpublished Spitsbergen MSS., 373 †; The Southern Andes: an Orographical Sketch, 253 †
- Coode, J. C., and W. Matthews, Dover Harbour Works, 363 †
- Cook Archipelago, Annexation of, 565
- Cook, Captain, Memento of the death of, 691
- Cook, F. A., Through the First Antarctic Night, 703 †
- Cook Islands, Report for 1899 (Colonial Rep.), 703 †
- Cook's Voyage round the World, Illustrations of the Botany of, by Sir J. Banks and Dr. D. Solander, 254 †

- Cooke, —, Coal Crisis in Russia, 245 †
 Cooke, John, Handbook for travellers in Ireland, 574 †
 Copenhagen, the capital of Denmark, published by the Danish Tourist Society, 242 †
 Cordeiro, F. J. B., Tropical Hurricanes, 493 †
 Corfu—
 Corfu et les Corfiotes, par A. de Claparède, 361 †
 Cornish, Vaughan, award to, 117; Formation des Dunes de Sab'e, 258 †; On Desert Sand-dunes bordering the Nile Delta, 250 †
 Corona and Coronet, being a narrative of the Amherst Eclipse Expedition to Japan, by Mabel L. Todd, 592 †
 Correvon, H., La Vallée de Tourtemagne, en Valais, 695 †
 Corsica—
 Trade of (Foreign Office Rep.), 243 †
 Corunna and District, Trade of (Foreign Office Rep.), 245 †
 Costa Rica and Colombia, The Boundary between, 564
 Cotton, General F. C., Irrigation in India, 697 †
 Coudray, M. Lallier du, Madagascar au point de vue économique, 251 †
 Coudreau, O., Voyage au Trombetas, 490 †
 Courtaux, E., y F. V. Guzmán, Tratado de Geografía Commercial, 591 †
 Craigie, Major P., Address to the Economic Science and Statistics Section of the British Association, 705 †
 Crawford, R. F., The Food Supply of the United Kingdom, 121 †; note on, 220
 Creak, Captain, remarks on the *Southern Cross* Expedition to the Antarctic, 412
 Crepy, M. Paul, Vingt ans de présidence de Société de Géographie de Lille, 132 †
 Crimea—
 In the Haunted Crimea, by M. M. Norman, 363 †
 Cromer, Lord, report on Finances, etc., of Egypt in 1899, 102
 Cross, Cape, Cáo's padrão erected at, 633, 634
 Crust-torsion, The Origin of Land-forms through, by M. M. Ogilvie Gordon, 457 *
 Cuba—
 Census, Results of the, by H. Gannett, 491 †
 Trade of (Foreign Office Rep.), 585 †
 Cuinet, Vital, La Turquie d'Asie, 248 †
 Cupet, Captain, work of, in the Pavie Mission in Indo-China, 473; Voyages au Laos et chez les Sauvages du sud-est de l'Indo-Chine, 248 †
 Curaçoa, Trade of (Foreign Office Rep.), 254 †
 Currents—
 Australian Waters and the Southern Ocean, Mr. H. C. Russell's Observations on currents in, 689
 Currents—continued.
 Current Papers, No. 4, by H. C. Russell, 374 †; note on, 689
 Gulf of St. Lawrence, *Régime* of the currents in the, 685
 Under-currents in the River Congo, Report on the, by Commander H. E. Pury-Cust, 258 †
 Curtin, Margaret H., Some Common Geographical Definitions, 260 †
 Curtis, W. E., The Road to Bolivia, 490 †
 Curtius, E., and J. A. Kaupert, Karten von Attika, 496 †
 Curzon, Baron, Ancient Monuments in India, 577 †
 Cvijić, Prof. J., Die Macedonischen Seen, 246 †; La période glaciaire dans la péninsule des Balkans, 483 †; Morphologische und glacielle Studien aus Bosnien, der Hercegovina und Montenegro, 483 †; Researches in Macedonia and Southern Albania, 215 *
 Cyclades, Trade of the (Foreign Office Rep.), 244 †
 Cyclones—
 Combinaison des effets des révolutions synodique et tropique de la Lune, par M. A. Poincaré, 493 †
 Tropical Hurricanes, by F. J. B. Cordeiro, 493 †
 Czirbuez, Dr. G., Am Ozernya-See, 571 †
- D.
- DAHOMÉ—
 Dahomé, ressources économiques et avenir commercial, par G. Borelli, 368 †
 Notice sur le, par J. Fonssagrives, 699 †
Daily Telegraph Expedition in Central Africa, 331, 558
 Daish, W., Melbourne to Tokio, 486 †
 Dakhilah, Oasis of, 655
 Dakota—
 South, Moraines of, by J. E. Todd, 581 †
 Dale, T. N., The Slate Belt of Eastern New York and Western Vermont, 571 †
 Dal Pinz, Dr. G., Grotte e fenomeni carsici del Bellunese, 571 †
 Dampier, William, Leben und Werke von Dr. P. Verbeek, 494 †
 Danckelman, Dr. A. v., Klima von Neu-Guinea, 255 †
 Danga Bash or Tashkurgan river, 519
 Danish Expedition to the Pamirs under Lieut. Olufsen, 99
 Danish Expedition to East Greenland, 231;
 Danish East Greenland Expedition in 1900, by Lieut. G. C. Amdrup, 662 *
 Danish Ingolf-Expedition, 374 †
 Dantz, Dr., Ergebnisse der geologischen Expedition der, 250 †; Geological work in Northern Nyssaland, 106
 Darapsky, L., Das Département Taltal, 702 †
 Darton, N. H., Report on the Geology and Water Resources of Nebraska, 371 †

Date-Line—

- Where the Day Changes, by Dr. W. Downing, 587 †
- Davis, A. P., Water Supply for the Nicaragua Canal, 585 †
- Davis, P. L. H., "Chronometer" Tables, 587 †; Star's and Sun's true bearings or Azimuth Tables, 492 †
- Davis, Prof. W. M., Glacial Erosion in the Valley of the Ticino, 121 †; The Fresh-water Tertiary Formations of the Rocky Mountain Region, 371 †; Practical Exercises in Geography, 260 †
- Davison, C., On some Minor British Earthquakes, 121 †
- Dawson, G. M., Economic Minerals of Canada, 489 †
- Dawson, S. E., The Lines of Demarcation of Pope Alexander VI., 494 †
- Dawson, W. Bell, Illustrations of Remarkable Secondary Tidal Undulations . . . in the Region of Nova-Scotia, 125 †; Survey of Tides and Currents in Canadian Waters, 582 †
- Dead Sea, The, by Gray Hill, 579 †; note on, 555; Dead Sea, The, by Major-General Sir C. Wilson, 698 †
- Deane, H., Suggestions for depicting diagrammatically the Character of Seasons, etc., 588 †
- Dearmer, Percy, Highways and Byways in Normandy, 120 †
- Deasy, Captain H. H. P., Journeys in Central Asia, 141,* 501*; remarks on receiving Medal, 115
- De Barros, João, account of Bartholomeu Dias' voyage, 639
- Deckert, Dr. E., Die Nordamerikanische Union als Weltmacht, 701 †
- Dècle, M., expedition in Central Africa, 351, 558
- Deep-sea Expedition, Dutch, 111, 549
- Degree-measurement in Spitsbergen, 111, 567, 688
- Delagoa Bay—
Delagoa-Bucht, Die, 125 †
- De la Métherie's Contributions to the Science of Physical Geography, Prof. S. Günther on, 110
- Delbrel, G., De Fez à l'Oranie à travers le pays des Ghiata, 581 †
- Delgado, J. F. N., e P. Choffat, Carta Geologica de Portugal, 136 †
- Demanche, M. G., Les projets de Cables, 131 †; Occupation d'In-Salah, 251 †
- Demidoff, E., After Wild Sheep in the Altai and Mongolia, 696 †
- Dempster, H. G., Railway Surveying with the Tacheometer, 256 †
- Deniker, J., Les Races de l'Europe, 119 †; Les Races et les Peuples de la Terre, 493 †; Résultats . . . du voyage de M.M. Roborovsky et Kozlov en Asie centrale, 247 †
- Denmark—
Copenhagen, the Capital of (Danish Tourist Society), 242 †
- Danske Turistforenings Aarskrift, 119 †
- Nautical-Meteorological Annual, 119 †
- Trade and Agriculture of (Foreign Office Rep.), 570 †
- Depéret et Fourtau, MM., Sur les terrains néogènes de la Basse-Egypte, 580 †
- Deposits—
Analyse mécanique des sols sous-marins, par J. Thoulet, 589 †
- De Quiros—
Did De Quiros land in Queensland? by T. F. Bevan, 479, 494 †
- d'Escayrac de Lauture, Comte, voyageur et explorateur français, par P. Durand-Lapie, 494 †
- Devon and Cornwall—
Thorough Guide Series, North Devon and North Cornwall, etc., by C. S. Ward, 574 †
- Dhofar, Mr. and Mrs. Bent's explorations in, 101
- Dias, Bartholomeu, and Diogo Cão, Voyages of, 1482-88, 625*; Appendix on the Maps illustrating the, 649; List of Place-names, 651
- Dicey, E., South African Reconstruction, 370 †
- Dickenson, B., and A. Andrews, The "Diagram" Series of Geological Lantern Slides of Maps, 709 †
- Dickson, H. N., The Circulation of the Surface Waters of the North Atlantic, 589 †; The Mean Temperature of the Surface Waters of the Sea round the British Coasts, 130 †
- Diener, Prof. Dr. C., Ueber . . . die Structur der Südosttirolischen Dolomitstöcke, 119 †; Die geologischen Ergebnisse der Reisen von Baron E. Toll, 698 †
- Dietel, Dr. P., Einiges über die geographische Verbreitung der Rostpilze, 374 †
- Diguet, L., La Basse-Californie, 371 †
- Diller, J. S., The Coos Bay Coal Field of Oregon, 371 †; Educational Series of Rock Specimens collected . . . by the U.S. Geological Survey, 490 †
- Dinka tribe, Central Africa, 179
- Djaushankuz valley, Shugnan, 671
- Doby, M. V., La Navigabilité de la Loire, 360 †
- Dodge, R., Life on the Colorado Plateaus, 252 †
- Dolomites, Torsion Structure of the, 462, 463
- Donaldson, Florence, Lepcha Land, or Six Weeks in the Sikhim Himalayas, 697 †
- Donaldson Mountains, New Guinea, 269
- Dorset—
Rainfall, etc., of, by H. S. Eaton, 574 †
- Douglas, Hon. John, Past and Present of Thursday Island and Torres Straits, 128 †
- Dove, Dr., Geographisches über den Kriegsschauplatz in Südafrika, 251 †

- Dover Harbour Works, by J. C. Coode and W. Matthews, 363 †
- Downing, Dr. A., Where the Day Changes, 587 †
- Doyle, P. J., Tifones del Archipiélago Filipino y mares circunvecinos, 248 †
- Doyle, K. D., The Rio Del Fuerte of Mexico, 582 †
- Drapeyron, L., Le général Tricoche, 590 †
- Duke of York island, Antarctic, 390
- Dundas, —, Trade of German East African Coast Towns, 368 †
- Dunn, E. J., Notes on the Dwyka Coal Measures at Vereeniging, Transvaal, 370 †
- Dunraven, Earl of, Self-instruction in the Practice and Theory of Navigation, 703 †; note on, 690
- Dunstan, B., Report on the Geological Features of the Country between Warren and Mount Lion, 586 †
- Duponchel, A., Les actions planétaires et la température terrestre, 588 †; Les inondations et la charité collective, 120 †; Questions de politique coloniale, 590 †
- Dupuy, Paul, Le Sol et la croissance de Paris, 484 †
- Durand-Lapie, P., Le Comte d'Escayrac de Lauture, 494 †
- Dutch East Indies—
Études scientifiques concernant les possessions Néerlandaises aux Indes Orientales, par C. M. Kan, 365 †
Guide à travers la section des Indes Néerlandaises, 375 †
- Dutch Siboga Expedition to the Malay Archipelago, 111, 549 *
- Dutta, P. N., Notes on the Geology of the country along the Mandalay-Kunlon Ferry Railway Route, 577 †
- E.
- EARTH—
Configuration of the Earth's Surface, by Sir J. Lubbock, 257 †
Déformation tétraédrique de la Terre, par M. Bertrand, 130 †
Face de la Terre, par Ed. Suess, 130 †
Geological Age of the Earth, An Estimate of the, by J. Joly, 373 †, 588 †
Symétrie tétraédrique du globe terrestre, par M. de Lapparent, 130 †
- Earthquakes—
Large Earthquakes recorded in 1899, by Prof. J. Milne, 443
- Earth Temperature—
Jordtemperatur bestämningar, af T. Hömén, 493 †
- East Indies—
Maps: Atlas der Nederlandsche Bezittingen in Oost-Indie (Netherlands Government), 187 †
- Eaton, H. S., Returns of Rainfall, etc., in Dorset, 574 †
- Ebeling, Max, Der Ararat, 247 †
- Ebers, G., Aegyptische Studien und Verwandtes, 488 †
- Ebstorf Map—
Ebstorkarte, eine Weltkarte aus dem 13. Jahrhundert, von Dr. Konrad Miller, 131 †
- Eclipse—
Local Particulars of the Total Eclipse of the Sun, 1901, 256 †
Total Eclipse of the Sun, 1900, Prof. H. D. Todd and Prof. S. Brown, 260 †
- Economics—
Comparaison du travail à la main et du travail à la machine, par E. Levasseur, 260 †
- Ecuador—
Arc méridien de Quito, Reconnaissance de l', par E. Maurain, 491 †; Rapport sur le projet de revision de l', par Poincaré, 491 †; note on, 356
- Education—
General Intelligence Papers, by G. Blunt, 375 †
- Edwards, Alphonse Milne, par M. Grandidier, 259 †
- Egerton, H. E., Sir Stamford Raffles, 590
- Eggers, Lieut., Bericht über eine Reise nach dem Okavangogebiet, 580 †; note on, 561
- Egnel, M., Le climat de la Suède et les causes des variations de climat, 695 †
- Egypt—
Aegyptische Studien und Verwandtes von G. Ebers, 488 †
Art de la fortification dans la haute antiquité égyptienne, par R. Weill, 367 †
Cairo and Egypt and Life in the Land of the Pharaohs, by H. J. Kemeid, 699 †
Desert Sand-dunes bordering the Nile Delta, by Vaughan Cornish, 250 †
From the Egyptian Ramleh, by Rev. A. A. Boddy, 124 †
Gold Mining in Egypt, Ancient and Prospective, by C. J. Alford, 367 †; note on, 557
- Maps: Aufnahmen in der Östlichen Wüste von Ägypten, von G. Schweinfurth, 708 †; General Map of (Survey Department Public Works Ministry), 136 †; The Dakhla Oasis (Survey Department, Cairo), 595 †; The First or Assuan Cataract (Survey Department, Cairo), 595 †
- Recensement Général de l'Égypte, 488 †
- Redemption of, by W. Basil Worsfold, 367 †
- Report by Lord Cromer on Egypt in 1899, 102
- Senussi and his threatened Holy War, by T. B. Threlfall, 124 †
- Stone Implements, On a Collection of, made by Mr. Seton-Karr, by H. O. Forbes, 250 †

- Egypt—*continued*.
 Terrains néogènes de la Basse-Egypte, par MM. Depéret et Fourtau, 580 †
 Egypt and the Sudan—
 Finances, Administration and Condition of, Reports . . . on, 488 †
 Egyptian Text—
 Mythological - Geographical Text, by Prof. Dr. A. Wiedemann, 494 †
 Ekman, W., Ein Beitrag zur Erklärung und Berechnung des Stromverlaufs an Flussmündung, 258 †
 Elba, Trade of (Foreign Office Rep.), 571 †
 Elbe—
 Elbestrom, sein Stromgebiet, etc., 571 †; review, 552
 Ellesmere Land, Mr. Stein's expedition to, 689
 Ellet, F., Long Kin Hole, 246 †
 Emerald Mines of Northern Etbai, by D. A. Mac Alister, 537 *
 Emerson, B. K., The Geology of Eastern Berkshire County, Massachusetts, 583 †
 Empires, 850 B.C. to 330 B.C., The Passing of the, by G. Maspero, 705 †
 Endlich, Dr. R., Zur Etymologie des Wortes "Paraguay," 254 †
 England—
 Blue-John-Mine à Castleton (Angleterre), par MM. Barnes et Holroyd, 695 †
 Constitutional Relations of England and Her Dependencies, by Sir C. Roe, 375 †
 Dover Harbour Works, by J. C. Coode and W. Matthews, 363 †
 Expansion of, by E. D. Mead, 495 †
 Fragment of the Geography of, by H. R. Mill, 246 †
 Gaping Ghyll Hole, by Ed. Calvert, 246 †
 Lake District, Thorough Guide Series, by M. J. B. Baddeley, 363 †
 Long Kin Hole, by F. Ellet, 246 †
 England and Wales—
 Ordnance Survey Maps, 134 †, 261 †, 377 †, 496 †, 592 †, 707 †
 Reduced Ordnance Survey of, by J. Bartholomew, 134 †, 708 †
 Engler, A., Ueber die Vegetationsverhältnisse des Ulugurgebirges in Deutsch-Ostafrika, 250 †
 Englisch, K. R. von, Die Hohe Tatra und die Alpen, 570 †
 Enneberg, Crust-torsion at, 458
 Erebus and Terror, Mounts, Antarctic, 398
 Erie, Lake, Influence of Wind on the Level of, Prof. A. J. Henry on, 685
 Erk, F., Die wichtigsten Bergobservatorien, 374 †
 Erlanger, C. v., und O. Neumann, über ihre Reise in Nordost-Afrika, 581 †
 Erskine, T., Report on the Shipping and Shipbuilding on the American Lakes, 353
 Erzeroum, Trade of (Foreign Office Rep.), 698 †
 Esch, Dr. E., Ueber das Küstengebiet von Kamerun, 580 †
 Eskimo Seal Lake, Labrador, 686
 Esmeralda or Todos los Santos lake, 33
 Estrine, L., Un port franc à Marseille, etc., 360 †
 Etbai, Northern, The Emerald Mines of, by D. A. Mac Alister, 537 *
 Etymology of Africa and Ophir, by Sir George Birdwood, 134 †
 Euphrates and Tigris—
 Am Euphrat und Tigris, von E. Sachau, 578 †
 Europe—
 Astronomische Arbeiten des k. k. Gradmessungs-Bureau, von Dr. E. Weiss und Dr. R. Schram, 483 †
 Commercial Relations of the United States with Foreign Countries (Europe), 570 †
 Early Metallurgy of Copper, etc., in Europe, by W. Gowland, 119 †
 Hohe Tatra und die Alpen, von K. R. von Englisch, 570 †
 Kopfformen in Europa, Die Verteilung der, von Emil Schmidt, 119 †
 Korstoge fra Norden til den spanske Halv, af A. Fabricius, 484 †
 Maps: Luftdruck und Temperatur-Verteilung über Europa in verschiedenen Höhen am März 1899, von Dr. Hergesell, 135 †; Orographical map of, by H. J. Mackinder, 593 †
 Memel, Pregel- und Weichselstrom, von H. Keller, 570 †
 Memel, Pregel- und Weichsel-Gebietes, Klimatischen Verhältnisse des, von V. Kremser, 570 †
 Militär-topographischen Arbeiten in den europäischen Staaten, Organisation der, von V. Haardt, 484 †
 Popolazione dell' Europa, del F. M. Pasanisi, 242 †
 Races de l'Europe, par J. Deniker, 119 †
 Sailing Directions for the West Coasts of France, Spain, and Portugal, 364 †
 Strategic Geography of Europe, etc., by T. M. Maguire, 119 †
 Eversley, T., The Trinidad Reviewer, 702 †
 Eysséric, J., Exploration et Captivité chez les Gouros, 251 †
- F.
- FABRE, L. A., Les ensablements du littoral gascon et les érosions sous-pyrénéennes, 484 †
 Fabricius, A., Korstoge fra Norden til den spanske Halv, 484 †
 Faivre and Potter, MM., Explorations in the Sobat Basin, 476
 Fallot, E., La situation économique de la Tunisie, 370 †
 Farquharson, Colonel Sir John, Foreign Topographic Maps, 129 †; remarks on "Methods of Survey employed by the

- Chilean Boundary Commissions," 344;
Twelve Years' Work of the Ordnance Survey, 361 †
- Furrell, R. C., Railway Flood-Works in the Punjab and Sind, 577 †
- Fasquelle, E., Plan de l'Exposition Universelle de 1900, 262 †
- Fauvel, A. A., Corée: Le port de Ma-San-Pho, 697 †; Le chemin de fer de Peking à Nieou-tehouang, 486 †; La Découverte des îles Seychelles d'après des Documents inédits, 247 †; Le nouveau port de San-tou-ao, 247 †; L'œuvre géographique de la mission de Zi-ka-wei, 556, 575 †
- Feigl, H., Der Aufstand der Boxer, 575 †
- Feilden, Colonel, Contributions to Glacial Geography, by Prof. T. G. Bonney, 495 †
- Ferrars, Max and Bertha, Burma, 365 †
- Field Testing for Gold and Silver, by W. H. Merritt, 493 †
- Filippi, F. de, The Ascent of Mount St. Elias by the Duke of Abruzzi, 252 †
- Finland—
Finland i utländsk historisk litteratur, af R. Lagerborg, 363 †
Ortbeskrifningen i Finland på 16- och 1700-talen, af B. Boldt, 245 †
Pflanzen-phänologische Beobachtungen in, von A. O. Kihlman, 363 †
Primitiva formationernas geologi . . . Finlands, af F. J. Wiik, 363 †
Rakennustyyppiä Reski-Suomen pohjoisosasta, by O. A. Joutsen, 245 †
Sääksmäki Socken, af J. E. Rosberg, 120 †
Självmorden i Finland, 1861-1895, af F. W. Westerlund, 363 †
Thierphänologische Beobachtungen in, von K. E. Stenroos, 363 †
Trapa-förande torfmosse på Åland, af P. H. Olsson, 245 †
- Fiorini, M., Proiezioni cartografiche cicloidali, 129 †
- Fischer, Dr. K. T., Ein neues Barometer, 493 †
- Fjords—
Topographisch-geologische Studien in Fjordgebieten, von O. Nordenskjöld, 588 †
- Flamand, G. B. M., Mission au Tidikelt, archipel Touatien, 224, 369 †; Une Mission d'exploration scientifique au Tidikelt, 369 †
- Fletcher, H., Descriptive Note on the Sydney Coal Field, Nova Scotia, 252 †
- Flett, J. S., The Old Red Sandstone of the Orkneys, 695 †
- Flexner, Prof., and Prof. Barker, Report on a special Commission sent to the Philippines . . . to investigate prevalent diseases, 698 †
- Fly river, Natives of the, 414
- Foa, E., Coupe de l'Afrique équatoriale du sud-est au nord-ouest, 579 †; De l'Océan Indien à l'Océan Atlantique, 121 †
- Fogs and their Teaching, by Rev. J. M. Bacon, 257 †
- Foncin, M. P., Bordeaux et l'esprit Colonial, 243 †
- Fonssagrives, J., Notice sur le Dahomey, 699 †
- Foochow, Trade of (Foreign Office Rep.), 247 †
- Forbes, H. O., On a collection of Stone Implements made by Mr. Seton-Karr, 250 †
- Forbes, J. D., Travels through the Alps, 242 †
- Foreign Missions, Seventieth Report on, to the General Assembly of the Free Church of Scotland, 495 †
- Forel, Dr. F. A., et Dr. Lugeon, Les variations périodiques des glaciers des Alpes, 569 †
- Forke, A., von Peking nach Chi'ang-su und Lo-yang, 486 †
- Forlong, Major-General J. G. R., letter from, on the Life of Calcutta as a Seaport and the Mercantile Capital of Asia, 238
- Foster, C. Le Neve, Mines and Quarries: General Reports and Statistics, 258 †
- Foureaux and Lamy, MM., Expedition in the Lake Chad Region, 349, 557
- Fournau, La Mission, 250 †
- Fournier, A., Des noms de lieux ayant pour racine les noms du dieu *Belen*, *Bel*, 120 †
- Fournier de Flaix, E., Les premiers Boers, 125 †
- Fournier, E., Les réseaux hydrographiques du Doubs et de la Loue, etc., 360 †
- Fournier et Magnin, MM., Recherches spéléologiques dans la chaîne du Jura, 244 †
- Fournier, J., Une Société de Géographie à Marseille en 1801, 131 †
- Fox, C. B., The construction of the Simpson Tunnel, 483 †
- Fox, Dr. R., Die Pässe der Sudeten unter besonderer Berücksichtigung der Zentralsudeten, 243 †
- Fox, F., The Great Alpine Tunnels, 483 †
- Fox, G. H., Selangor Government Railway, 578 †
- France—
Antibes, Le port et le quartier maritime d', par M. Vinson, 570 †
Aven Armand, les Grottes de Ganges, etc., par E.-A. Martel, 243 †
Cambrésis, Le, par M. A. Malotet, 570 †
Canal de jonction du Rhône à Marseille, par M. J. C. Roux, 360 †
Divisions administratives de la France actuelle, par P. Gaffarel, 360 †
Doubs et de la Loue, Les réseaux hydrographiques du, par E. Fournier, 360 †
Ensalements du littoral gascon et les érosions sous-pyrénéennes, par L. A. Fabre, 484 †

France—continued.

- Ethnologie de la Savoie et de Haute-Savoie, par Dr. E. Pittard, 484 †
 Fumades, Les (près Alais, Gard), par P. G. de Rouville, 120 †
 Gravenoire, Le volcan de, par P. Glangeaud, 360 †
 Inondations et la charité collective, par M. A. Duponchel, 120 †
 Lorraine, Sur la dénudation de l'ensemble du plateau lorrain, par M. Bleicher, 243 †
 Lyon et la Colonisation française, par prof. M. Zimmermann, 484 †
 Maps: Plans of Paris and the Exhibition, with map of France, by W. and A. K. Johnston, 135 †
 Monnaie de Paris à l'Exposition Universelle, 360 †
 Naufrages pour l'année, 1896, Rapport sur la Statistique des, 361 †
 Noms de lieux ayant pour racine les noms du dieu *Belen*, *Bel*, par A. Fournier, 120 †
 Orange, Une ancienne Capitale, par M. E. Roussel, 570 †
 Padirac, Étude d'hydrologie souterraine, par M. E.-A. Martel, 360 †
 Padirac, Sur de nouvelles constatations dans la rivière souterraine de, par M. E.-A. Martel, 484 †
 Redon, Cartes agronomiques du canton de, par M. G. Lechartrie, 243 †
 Vents dans les golfes du Lion et de Gascogne, par M. Hantreux, 361 †
 France and Belgium—
 Géographie physique du Nord de la France et de la Belgique, par J. Gosselet, 120 †
 Francke, H., Eine Besteigung des Karsongpases (Kaschmir), 697 †
 Franco-Spanish Boundaries in West Africa, 225
 François, Curt v. (Biography), 132 †
 Frankenfeld, H. C., Vertical Gradients of Temperature, Humidity, and Wind Direction, 583 †
 Frankfield, H. C., Kite Work of the Weather Bureau, 257 †
 Frankfort-on-Main, Trade of (Foreign Office Rep.), 571 †
 Franz Josef Land—
 Duke of Abruzzi's expedition to, 597
 Nansen und Payer's Karte von, von G. R. von Brosch, 109, 128 †
 Fraser, M. A. C., Western Australian Year-Book, 586 †
 Frazer, J. G., Pausanias and other Greek Sketches, 571 †
 French Colonies—
 "Atlas des colonies françaises," Un nouvel, par P. Pelet, 137 †, 376 †, 379 †, 709 †
 Colonial Expansion of France, by Prof. J. C. Braeq, 376 †
 Conférence de M. le Col. Monteil sur le Domaine colonial de la France, 376 †

French Colonies—continued.

- Exploitation de notre Empire colonial, par L. Vignon, 495 †
 French Colonies (Foreign Office Rep.), 376 †
 French Explorations in the Sobat Basin, 476
 French Islands and New Britain, Herr v. Bennigsen's visit to, 565
 French Jesuit Mission in China, Geographical work of the, 556
 Fricker, Dr. K., The Antarctic Regions, 586 †
 Friederichsen, Dr. M., Russisch Armenien und der Ararat, 248 †, 578 †
 Fuchau: see Foochow.
 Fuchs, Prof. T., Kritische Bemerkungen zu Dr. Natterer's "Chemisch-Geologischen Tiefseeforschungen," 589 †
 Fülleborn, Dr. F., Ueber Untersuchungen im Nyassa-See und in den Seen im nördlichen Nyassa-Land, 579 †; note on, 561
 Fulst, Dr. O., Kohlenstationen und Flot tenstützpunkte, 494 †; Zur Höhenberechnung, 587 †
 Fundy, Bay of—
 Sprungwelle und Fluthgrösse im oberen Theil der Fundy-Bai, von Dr. G. Schott, 125 †
 Futaleufú river, Patagonia, 192

G.

- Gaffarel, P., Le capitaine Paulmier de Gonneville, 375 †; Les divisions administratives de la France actuelle, 360 †
 Gallop (Rudolf), Lake, 292, 298
 Gallouédec, L., La Navigation intérieure en Allemagne, 361 †
 Galvão, Antonio, voyages of, 625
 Gambier Islands, Mangareva Dictionary, by E. Tregear, 255 †
 Game—
 An Age of Extermination, 131 †
 Preservation of, in Africa, 105
 Gamo district, Abyssinia, 297
 Ganges, changes of the, 238
 Gannett, H., A Dictionary of Altitudes in the United States, 490 †; A Gazetteer of Kansas, 583 †; The Results of the Cuban Census, 491 †
 Gaping Ghyll Hole, by Ed. Calvert, 246 †
 Garcia, Father José, voyages of, 19
 Garde, Cape, East Greenland, 663
 Gardini, Dr. C., In der Sternnebener-Republik, 701 †
 Garofalo, F. P., Contributi alla storia delle provincie occidentali dell'impero Romano, 361 †
 Garron, M., Argentina ed Uruguay, 254 †
 Garsault, A. G., Notice sur la Réunion, 700 †
 Gaspe Current of the Gulf of St. Lawrence 685

- Gastrell, —, Economic Position of the German Empire in 1900..243 †
- Gautier, E. F., Les Hova sont-ils des Malais? 369 †
- Gavelin, Axel, On the glacial lakes in the upper part of the Ume river-valley, 695 †
- Gaza, Province of, Portuguese East Africa, Captain Gomes da Costa on, 350
- Geikie Land, Antarctic, 394
- Geikie, Sir A., Notes on some Specimens of Rocks from the Antarctic Regions, 586 †; Presidential Address by, Section C. Geology, 257 †
- Gennes, A. de, et A. Bonard, Les roches volcaniques du Protectorat des Somalis, 488 †
- Geodesy—
Aufgabe der modernen Geodäsie, von V. Carlheim-Gyllensköld, 129 †
Præcisionsnivelementet over Öresund, af General-Major G. Zachariæ, 129 †
Recent Progress in Geodesy, by Dr. J. F. Huyford, 129 †
Veröffentlichung des Königl. Preussischen Geodätischen Institutes, 587 †
- Geodetic Survey in British South Africa, 474, 488 †
- Geographical and Geological Terminology, Signor O. Marinelli on, 113
- Geographical Congress—
Congrès National des Sociétés Françaises de Géographie, 376 †
Septième congrès international de géographie à Berlin, par J. Leclercq, 184 †, 260 †
- Geographical Discovery—
Scoperte geografiche del secolo XIX. del Prof. F. Porena, 375 †
- Geographical Index to Books, Periodicals, etc., compiled by A. Knox, 495 †
- Geographical Literature of the Month—
Africa, 124, 249, 367, 487, 579, 698
America, 125, 252, 370, 489, 582, 701
Anthropogeography and History, 131, 258, 375, 493, 590, 705
Asia, 121, 246, 365, 485, 574, 696
Australasia and Pacific Islands, 127, 254, 372, 491, 585, 703
Biography, 132, 259, 494, 590, 705
Europe, 119, 242, 360, 483, 569, 694
General, 133, 259, 360, 375, 495, 590, 706
Mathematical Geography, 129, 256, 492, 587, 703
Physical and Biological Geography, 129, 257, 373, 493, 588, 704
Polar Regions, 128, 255, 373, 491, 586
- Geographical Society—
Société de Géographie à Marseille en 1801, par Joseph Fournier, 131 †
- Geographical Year-book—
Geographisches Jahrbuch, von H. Wagner, 376 †
Apperception in Geography, by M. E. Kelton, 376 †
- Geography—
Begründung der Lehrkanzel für Geographie und des geographischen Institutes an der Universität Wien, von Dr. A. Penek, 706 †
British Association, Bradford, Proceedings of, 441
Conception actuelle de la Géographie, par M. G. Lespagnol, 260 †
Deutschen Hochschulen im Sommersemester, Geographische Unterricht an den, 260 †
Elementary Schools, Progress of Geographical Instruction in, Mr. T. G. Rooper on, 442
Enseignement de la géographie dans les collèges, par Raymond de Girard, 133 †
Enseignement de la Géographie, Réforme de l', par Dr. J. Vincent, 375 †
Entwicklung der Geography im xix Jahrhundert in einigen Merkszahlen, von W. Wolkenhauer, 260 †
Historical: Ueber Identifizierung antiker Oertlichkeiten, von W. Ruge, 131 †
Intermediate School Geography, by T. W. Pettipiece, 706 †
Irish School Geography, by T. W. Pettipiece, 706 †
Kohlenstationen und Flottenstützpunkte, von Dr. O. Fulst, 494 †
London University, Study of Geography in the, 112
Middelskolen, Geografi for, af Dr. Hans Reusch, 133 †
Mythological-Geographical Text, by Prof. Dr. A. Wiedemann, 494 †
Oxford School of, Scholarship of, 567; Programme for Michaelmas Term, 357
Oxford University, Diploma instituted, 112
Physical: Bedeutung de la Méthérie's für die Entwicklung der physikalischen Erdkunde, von Dr. S. Günther, 258 †; note on, 110
Political Geography and the Empire, by Sir G. S. Robertson, 447 *
Practical Exercises in Geography, by Prof. W. M. Davis, 260 †
Progrès de la Géographie en 1899, Rapport sur les, par le Baron Hulot, 260 †
Some Common Geographical Definitions, by Margaret H. Curtin, 260 †
Superficie geologica e superficie geografiche, por O. Marinelli, 113, 260 †
Tea, Geography of, 494 †
Tratado de Geografia Commercial de las cinco partes del Mundo, por E. Courtaux y F. V. Guzmán, 591 †
- Geology—
Geological and Faunal Relations of Europe and America during the Tertiary Period, etc., by Prof. H. F. Osborn, 130 †

Geology—*continued.*

- Geological Literature added to the Geological Society's Library, 375 †
 Presidential Address by Sir A. Geikie, Brit. Association, Section C, Geology, 257 †
 Geomorphology—
 Brückner, Ed., Die Feste Erdrinde und ihre Formen, von A. Penck, 704 †
 Déformation tétraédrique de la Terre et déplacement du pôle, note de M. M. Bertrand, 130 †; note on, 232
 Face de la Terre, La, par Ed. Suess, 130 †
 Fleuves sous-marins, par H. Benest, 704 †
 Gebirgshebung und Thalbildung, von E. Richter, 373 †
 Idee morfologica di Carlo Gemmellaro, by O. Marinelli, 257 †
 Morfologia della superficie terrestre nella Geografia, del Prof. E. Porena, 493 †
 Oeuvre de M. Suess, par A. de Lapparent, 373 †
 Symétrie tétraédrique du globe terrestre, Sur la, par M. de Lapparent, 130 †
 Valli aperte, frammenti di geografia fisica e sociale del colonnello C. Borzino, 493 †
 Geophysics—
 Problème du refroidissement de la croûte terrestre, etc., Note de J. Boussinesq, 373 †
 Gerlache, Capt. Adrien de, und Lieut. Georges Lecointe (Biography), 705 †
 German Arctic Expeditions, 356
 German Colonies—
 Colonial Publication, New, 358
 Deutsche Kolonialliteratur im Jahre 1898, von M. Brose, 260 †
 Deutschen Kolonialgesellschaft, Jahresbericht der, 495 †
 Deutschen Schutzgebiete, Jahresbericht über die Entwicklung der, 495 †
 Études d'Economie Coloniale, par H. Hauser, 495 †
 German Colonial Estimates (Foreign Office Rep.), 260 †
 German Colonies for year ending June, 1899 (Foreign Office Rep.), 591 †
 Koloniale Zeitschrift, note on, 358
 Weissbuch, Zwanzigster Theil, 495 †
 German Limnological Investigations in Lake Nyasa, 561
 German Pendulum Expedition in East Africa, 352
 Germany—
 Bad Nauheim and its Thermal Salt-Springs, Geology of, by A. V. Jennings, 571 †
 Deutsche Nordseeküste in physikalisch-geographischer und morphologischer Hinsicht, von R. Haage, 361 †
 Deutschen Dünen und ihr Bau, von Dr. E. Roth, 484 †

Germany—*continued.*

- Economic Position of the German Empire in 1900 (Foreign Office Rep.), 243 †
 Elbstrom, Der, 571 †; note on, 552
 Ethnographie der germanischen Stämme, von O. Bremer, 484 †
 Geodätischen Institutes, Königl. Preussischen, Veröffentlichung des, 361 †
 Ground-plan of Towns in, Dr. Otto Schlüter on, 235
 Maps: Murray's Handy Classical Maps, edited by G. B. Grundy, 496 †; Karte des Deutschen Reiches (Königl. Preuss. Landes-Aufnahme), 135 †; Wirtschaftlichen Beziehungen der deutschen Küsten zum Meere, von P. Langhans, 135 †
 Meteorologischen Instituts, Veröffentlichungen des K. Preussischen, 484 †
 Navigation intérieure en Allemagne, par M. L. Gallonédec, 361 †
 Northern Germany, Handbook for travellers, by Karl Baedeker, 484 †
 Pflanzen der Kunstbestände Norddeutschlands, etc., von Dr. F. Höek, 570 †
 Plant-life in, Influence of Latitude on, Prof. Ihne's observations, 680
 River-basins of North Germany, Geography of, 552
 Warum hat jedermann im Volk ein Interesse an einer starken deutschen Flotte? von H. Hartmann, 570 †
 Wirtschaftlichen Beziehungen der deutschen Küsten zum Meere, von P. Langhans, 361 †; note on, 220
 Gessert, F., Das Land zwischen Inachab und Bethanien, 250 †; Zur Harmattan-Frage, 251 †
 Giacomelli, F., Sulla latitudine di Monte Mario, 362 †
 Gibbons, Major, Expedition in Central Africa, 104
 Giglio Island—
 Insel Giglio, Die, by the Archduke Ludwig Salvator, 572 †
 Gilgit, Notes on the Geology of, by Lieut.-General C. A. McMahon, 365 †
 Girard, J., Les fluctuations du niveau des mers, 589 †
 Girard, Raymond de, Sur l'enseignement de la géographie dans les collèges, 133 †
 Giraud, H., Itinéraires de Mogador à Marrakech, 369 †
 Glacial Deposits—
 Bewegungsrichtungen des diluvialen Inlandeises, von Dr. J. Petersen, 493 †
 Glacières or Freezing Caverns, by E. S. Balch, 373 †
 Glaciers—
 Gletscher und Firnmoere, von R. E. Petermann, 257 †
 Gletscher conferenz im 1899, von Dr. E. Richter, 233, 257 †
 Glangeaud, P., Le volcan de Gravenoire, 360 †

- Glass, J. G. H., Railway Surveying in China, 346
- Glauning, Lieut., and Dr. Kohlschütter, Pendulum Observations in East Africa, 352
- Goa—
Trade of (Foreign Office Rep.), 577 †
Villages of, in the Early Sixteenth Century, by B. H. Baden-Powell, 123 †
- Gold Coast—
Northern Territories of the, Report on, by Lieut.-Colonel Northcott, 368 †; note on, 683
- Gold-mining in Egypt, Mr. Alford's report on, 367 †, 557
- Gombaz, Central Asia, 507
- Gombroon, Persian gulf, 213, 214
- Gomes da Costa, Captain, on the Province of Gaza, Portuguese East Africa, 350
- Gonneville, Le capitaine Paulmier de, par P. Gaffarel, 375 †
- Gonzaga, C. V. A., La Questione delle Lingue in Austria, 242 †
- Good Hope, Cape of, Discovery of, 639
- Gordon, General Sir Thomas, The Problem of the Middle East, 123 †
- Gordon, M. M. Ogilvie, The Origin of Land-forms through Crust-torsion, 457 *
- Gordon's Campaign in China by Himself, with an Introduction, etc., by Colonel Vetch, 576 †
- Gore, Colonel, On the Projection for a map of India and Adjacent Countries, 577 †; note on, 473
- Gorges, Captain G. H., A Journey from Lake Naivasha to the Victoria Nyanza, 78 *, 487 †
- Gorili, Somaliland, 603
- Gorman, M. W., Ice-cliffs on White River, Yukon Territory, 125 †
- Gosling, —, Trade of Paraguay, 372 †
- Gosselet, J., Géographie physique du Nord de la France et la Belgique, 120 †
- Göthenburg—
Göteborgs Turistförenings Årsskrift, 363 †
Trade of (Foreign Office Rep.), 695 †
- Götz, Dr. W., Die Frage der Vergletscherung des Central-Balkan, 569 †
- Götzen, Mount, and Mount Sharp, Central Africa, 170
- Gourdet, P., Le chemin de fer en Asie Centrale, 366 †
- Gowland, W., The Early Metallurgy of Copper, etc., in Europe, 119 †
- Grabowsky, Friedrich J. (Biography), 705 †
- Graian Alps, Scrambles in the Eastern, by G. Yeld, 483 †
- Grandidier, G., Voyage de la Reine Ranavalona I^{re} à Mananimerina, 369 †
- Grandidier, M. A. (Biography of), Alphonse Milne Edwards, 259 †
- Grandjean, A., Le bassin du Nkomati et sa communication avec le Limpopo, 124 †; note on, 350; La cartographie de la province de Lourenço Marques, 125 †
- Grasso, Prof. G., Metodo e misura nelle ricerche di toponomastica, 592 †
- Gravier, G., Vie de Samuel Champlain, 494 †
- Great Slave Lake, A Journey to, by D. T. Hanbury, 63 *
- Greece—
Handbook for Travellers in, by John Murray, 485 †
Maps: Karten von Attika, von E. Curtius und J. A. Kaupert, 496 †
Pausanias and other Greek Sketches, by J. G. Frazer, 571 †
Peloponnesian Journeys, by C. H. Young, 244 †
- Greenland—
Aperçu des "Med lelelser om Grönländ," par T. Kornerup, 373 †
East: Danish Expedition to, under Lieut. Amdrup, 231, 481, 597; Prof. Kalthoff's expedition in, 566
Danish East Greenland Expedition in 1900, by Lieut. G. C. Amdrup, 662 *
Lakes and Valleys of the Upper Nugsuak Peninsula, by T. L. Watson, 256 †
Myskoxen och myskoxjagter på Ost-Grönländ, af A. G. Nathorst, 587 †
Polarvargens invandring till östra Grönländ, 255 †
Svenska expeditionen till nordöstra Grönländ, af A. G. Nathorst, 492 †
- Gregory, Prof. J. W., The Geology of Mount Kenya, 249 †
- Greville, Hon. E., The Year-Book of Australia, edited by, 254 †
- Greville, —, Trade of Mozambique and Quillimane (Foreign Office Rep.), 251 †
- Grierson, G. A., On the Languages spoken beyond the North-Western Frontier of India, 577 †
- Griffin, Sir Lepel, Persia, 248 †
- Grinnell, G. B., The North American Indians of To-day, 701 †
- Groffier, Prof. V., La production de la soie dans le monde, 131 †; note on, 357; Explorations et travaux géographiques des Missionnaires Catholiques, 707 †
- Grogan, E. S., Through Africa from the Cape to Cairo, 161 *, 699 †; letter from, on his Picture of Mount Ruwenzori, 693
- Grogan, E. S., and A. H. Sharp, From the Cape to Cairo, 699 †
- Gros, M. G., La Salvétat et ses environs, 119 †
- Grosvenor, E. A., The Growth of Russia, 363 †
- Ground Waters—
Principles and Conditions of the Movement of, by F. H. King, 373 †
Theoretical Investigations of the Motion of, by C. S. Slichter, 374 †
- Grubb, W. B., The Chaco Boreal; the Land and the People, 491 †
- Grundy, C. B., Murray's Handy Classical Maps, Germania, etc., 496 †; Italia and Sicilia, 134 †; Palestine, etc., 498 †; note on, 234

- Guatemala—
 Café, La Culture du, par F. W. Morren, 254 †
 Caoutchouc au, 254 †
 Trade, Agriculture, and Finance of (Foreign Office Rep.), 585 †
 Guatemala and Salvador—
 Maps: Vulkan-Skizzen aus Guatemala und Salvador, von Dr. C. Sapper, 498 †
 Vulkane von, von Dr. Carl Sapper, 585 †; note on, 478
 Guénot, M. S., Les inondations de 1897 et les effets du déboisement des Pyrénées, 362 †
 Guest, A. R., The Oases of the Mudirieh of Assyut, 655 *
 Guglielmo, G., Intorno ad alcuni nuovi areometri ad immersione totale, 238 †
 Guiana—
 British: British Guiana and its Boundary, by E. F. im Thurn, 254 †; L'Arbitrage Anglo-Vénézuélien, par M. G. Vasco, 254 †; Reports for 1897-99 (Colonial Rep.), 702 †
 Guilmot, D., Cécara et Amazonie, 127 †
 Guinea—
 French: Les Simons, par J. Leprince, 250 †; La Guinée française, étude et souvenirs, par M. Maclaud, 250 †
 Guinea española, La, 251 †
 Guise, R. E., Photographs of scenery in vicinity of Kemp Welsh River, British New Guinea, 596 †
 Gulbentian, C. S., Photographs taken in the neighbourhood of Aras and Kur Rivers in Transcaucasia, 380 †
 Gulf Stream Water, On the Origin of, by P. T. Cleve, 130 †
 Günther, Prof. Dr. S., Die Bedeutung De la Métherie's für die Entwicklung der physikalischen Erdkunde, 258 †; note on, 110
 Günther, R. T., and J. J. Manley, On the Waters of the Salt Lake of Urmi, 123 †
 Guyot, Yves, Boers and Uitlanders, 251 †
 Gwaso Nyiro, Central Africa, 79
 H.
 HAAGE, R., Die deutsche Nordseeküste in physikalisch-geographischer und morphologischer Hinsicht, 361 †
 Haardt, V., Notizen über die organisation der militär-topographischen Arbeiten in den europäischen Staaten, 484 †
 Haberlandt, Dr. M., Dr. Oskar Baumann (Biography of), 494 †
 Haddon, Prof. A. C., Studies in the Anthropogeography of British New Guinea, 265 *, 414 *; remarks on "In the Heart of Borneo," 59
 Hadhramut, Mr. and Mrs. Bent's explorations in, 101
 Hagari people, New Guinea, 282
 Hague, A., Geology of the Yellowstone National Park, 584 †
 Haiti, Through, by H. Prichard, 306 *
 Hakodate, Trade of (Foreign Office Rep.), 697 †
 Hall, C. W., The Gneisses . . . of South-Western Minnesota, 583 †
 Hamburg and District, Trade of (Foreign Office Rep.), 361 †
 Hammer, Prof. Dr. E., Die Genauigkeit der Flächenangaben in der Geographie, 129 †; Unechteylindrische und unechtekonische flächentreue Abbildungen, 129 †
 Hammerich, A., Studier over islandsk Musik, 244 †
 Hanbury, David T., A Journey from Chesterfield Inlet to Great Slave Lake, 63 *, 479, 489 †; Photographs of the North-West Territories of Canada, 139 †
 Hangchow, Trade of (Foreign Office Rep.), 122 †, 486 †
 Hanno, The Log-book of, by J. D. White, 590 †
 Hansen, R., Zur geographischen Verteilung der Personennamen Schleswig-Holsteins, 485 †
 Harding, Major Colin, Expedition to the Source of the Zambezi, 349
 Harding, Rev. T., In Yorubaland, 251 †
 Harmer, F. W., on the climate of interglacial and glacial periods, 446
 Harris, Captain H. R., and Commander A. Havergal, Tide Tables for the British and Irish Ports, 635 †
 Harris, W. B., The Morocco Scare, 581 †
 Harrison-Whitehouse Expedition to countries south of Abyssinia, 103
 Harri-se, Henry, Per Amerigo Vespucci, 133 †
 Hartley, Sir C., A short history of the Engineering Works of the Suez Canal, 580 †
 Hartmann, H., Warum hat jedermann im Volk ein Interesse an einer starken deutsche Flotte?, 570 †
 Harvey, A., The Magnetic Influence of the Sun on the Earth and on Comets, 588 †; letter from, on the Aurora Australis and Borealis, 691-693
 Hasse, Dr. Ernst (Biography), 132 †
 Hasselt, A. L. van, De inhijving der V. Kota-Kampar, 123 †
 Hassert, Dr. K., Tracce glaciali negli Abruzzi, 485 †
 Hatcher, J. B., Some Geographic Features of Southern Patagonia, 254 †; Sedimentary Rocks of Southern Patagonia, 254 †
 Haupt, L. M., Efforts made to demonstrate the Practicability of the Reaction Breakwater at Aransas Pass, Texas, 253 †; The Reaction Breakwater . . . of the Mississippi River, 583 †; note on, 477
 Hausaland, The Expedition to, Letters from Bishop Tugwell, and Narrative of Rev. A. E. Richardson, 581 †
 Hauser, Prof. H., Etudes d'Economie Coloniale, 495 †; Etudes sur les colonies portugaises, Angola, 699 †

- Hautreux, M., Les vents dans les golfes du Lion et de Gascogne, 361 †
- Hawaii—
Hawaii and its People, by A. S. Twombly, 372 †
Trade of Hawaiian Islands (Foreign Office Rep.), 585 †
- Hayes, C. W., An Assumed Inconstancy in the Level of Lake Nicaragua, 254 †; Physiography of the Chattanooga District, 371 †
- Hayes, C. W., and A. H. Brooks, Ice Cliffs on White River, 371 †
- Hayford, Dr. J. F., Recent Progress in Geodesy, 129 †
- Hearn, —, Trade of Bordeaux and District, 243 †
- Heawood, E., on the commercial resources of Tropical Africa, 446
- Hedin, Dr. Sven, Explorations in the Lob Nor Region, 345, 472, 598; Die geographisch-wissenschaftlichen Ergebnisse meiner Reisen in Zentralasien, 696 †
- Heilprin, A., The Nicaragua Canal in its Geographical and Geological Relations, 127 †
- Heimbrod, G., Topographic Surveying, etc., 587 †
- Hein, Dr. W., Zur Erinnerung an Dr. P. Paulitschke, 590 †
- Heldring, E., Poeloe Weh, 697 †
- Hellmann, Prof. Dr. G., Regenkarte der Provinz Ostpreussen, 120 †
- Henkel, Dr. L., Berechnung der Dichte des Eisenbahnnetzes, 129 †
- Henrique, M. L., on Jibuti as a Port, 227
- Henry, Prof. A. J., on the Influence of Wind on the Level of Lake Erie, 685
- Herbertson, A. J., The Climate of South Africa, 370 †
- Hergesell, Prof. Dr. H., Luftdruck und Temperatur-Verteilung über Europa in verschiedenen Höhen am März 1899. . 135 †; Die Temperatur der freien Atmosphäre, 374 †
- Herrmann, J., Valparaiso, 490 †
- Hershey, O. H., Ancient Alpine Glaciers of the Sierra Costa Mountains in California, 252 †
- Heuse—
Volkadichte der Provinz Starkenburg, von Dr. K. Bergmann, 243 †
- Hettner, Prof. Dr. A., Ueber bevölkerungsstatistische Grundkarten, 129 †
- Hildebrandson, Prof. H. H., on Comparative Studies in Climate, 234; Quelques recherches sur les centres d'action de l'atmosphère, II. La Pluie, 257 †
- Hill, R. T., Geology and Geography of Jamaica, 354; Map of Texas, 263 †
- Hill, Mr. Gray, on the Rise of the Dead Sea, 555
- Himalaya—
Conformation of the, 527, 529
In the Ice World of, by F. B. and W. H. Workman, 577 †; review, 681
- Hira, Y., Skildringar ur Pueblofolkens Konstliv, 253 †
- Historical Atlas of Modern Europe, by R. L. Poole, 377 †, 708 †
- Hjort, Dr., O. Nordgaard and H. H. Graa, Report on Norwegian Marine Investigations, 131 †
- Höck, Dr. F., Eine Pflanzengeographische Untersuchung, 570 †
- Hoepli, M., Guida-Itinerario alle Prealpi Bergamasche, 362 †
- Hoghton, Captain F. A., Operations of the Mohmand Field Force, 123 †
- Holdich, Colonel Sir T. H., An Orographic Map of Afghanistan and Baluchistan, 527 †; Railway Connection with India, 444; remarks on "Journeys in Central Asia," 524; remarks on "King Menelik's Dominions, etc.," 305; War Maps, 492 †
- Holland—
Hollande, La, géographique ethnologique, etc., by M. F. Bernard and Others, 485 †
- Holmsen, A., Vore største indsjøer, 572 †
- Homén, T., Om jordtemperatur bestämningar, 493 †
- Honan and Shansi, coal mines in, 346
- Honduras, Trade of (Foreign Office Rep.), 585 †
- Hope, W. H. St. John, Notes on the Walls of Southampton, 121 †
- Hose, Charles, In the Heart of Borneo, 39 †, 578 †
- Hostains, E., De la Côte d'Ivoire au Soudan et à la Guinée française, 368 †
- Hostains-d'Ollone, La Mission, 700 †
- Hostains and D'Ollone, MM., Expedition from the Ivory Coast to the Sudan, 348
- Houdaille, Commandant, Le port et le chemin de fer de la Côte d'Ivoire, 580 †
- Howarth, O. H., The Cordillera of Mexico, 371 †
- Hualas range, Patagonia, 188
- Hubbard, J. M., Problems in China, 575 †
- Huber, R., Empire Ottoman, Division Administrative, 708 †
- Hübl, A. von, Die photogrammetrische Terrainaufnahme, 587 †
- Hugli river, 240
- Huichol Indians, Symbolism of the, by C. Lumholtz, 582 †
- Hulot, Baron, Rapport sur les progrès de la Géographie en 1899. . 260 †
- Hultzsch, E., Miscellaneous Inscriptions from the Tamil Country, 487 †
- Hungary—
Am Ozernya-See, von Dr. G. Czirbus, 571 †
- Wanderungen im Siebenbürgischen Erzgebirge und im Bihar-Kodru-Gebirge, von K. Siegmeth, 571 †
- Hunter, Sir W. W., A History of British India, 696 †
- Hunter, Sir W. W., and his Work, by J. A. R. Marriott, 259 †

- Hupfeld, F., Die Erschliessung des Kaburelandes in Nordtogo, 251 †
 Hutchins, D. E., Cape National Forests, 367 †
 Hyam, J. C., The Illustrated Guide to Algiers, 249 †

I.

IBERIAN Peninsula—

- Contributi alla storia delle provincie occidentali dell'impero Romano, por F. P. Garofalo, 361 †

Ice-breaker—

- Steamers for Winter Navigation and Ice-breaking, by R. Runeberg, 591 †
 Yermak Ice-breaker, by Vice-Admiral Makaroff, 260 †

Ice in Bering Sea, Mr. James Page on, 110

Iceland—

- Arkæologiske Undersøgelser paa Island, af D. Bruun, 244 †
 Glacial Palagonite-Formation of Iceland, by Helgi Pjetursson, 244 †
 Islande, L', par le Père Bonaventure, 571 †
 Islands Siedlungsgebiete während der landnámattíð, von O. Schumann, 361 †
 Jordskjaelv i Islands sydlige Lavland, af Dr. T. Thoroddsen, 362 †
 Studier over islandsk Musik, af A. Hammerich, 244 †

Ichang, Trade of (Foreign Office Rep.), 247 †

Ihne, E., Phänologische Mitteilungen, 704 †

Ihne, Prof., on the Influence of Latitude on Plant-life in Germany, 680

Ikoro people, New Guinea, 285

Illiciilliwaet, The Great Glacier of the, by G. and W. S. Vaux, 125 †; note on, 687

Illinois—

- Glacial Lobe of, by F. Leverett, 490 †

Im Thurn, E. F., British Guiana and its Boundary, 254 †

Incas, The—

- Ojos de Imaymana y el Señor de la Ventana, por S. A. Lafone Quevedo, 127 †

India—

- Ancient Monuments in, by Baron Curzon, 577 †
 Bahmani Dynasty, History of the, by Major J. S. King, 365 †
 Bewässerungssystem in Britisch-Indien, von Dr. C. E. Jung, 247 †
 Buddhist Monastery at Sohnäg, by V. A. Smith, 487 †
 Carte de l'Inde d'après Pomponius Mela, par L. Malavialle, 365 †
 Colaba Observatory, Note on the Disturbance of the Magnetical . . . Instruments at the, by N. A. Moos, 577 †
 Earthquake of June, 1897, Report on the, by R. D. Oldham, 696 †

India—continued.

- Forgotten Empire (Vijayanagar), A Contribution to the History of India, by R. Sewell, 696 †
 Geological Survey of, General Report, 487 †
 Goa, Villages of, in the Early Sixteenth Century, by B. H. Baden-Powell, 123 †
 Haramouk, Ascent of, by Dr. E. F. Neve, 365 †
 History of British India, by Sir W. W. Hunter, 696 †
 Industrial Development of, by J. A. Baines, 365 †
 Irrigation in India, by General F. C. Cotton, 697 †
 Languages spoken beyond the North-Western Frontier of India, by G. A. Grierson, 577 †
 Madras Meridian Circle, Observations of the Fixed Stars made with the, by C. M. Smith, 365 †
 Malakand Field Force, Operations of the, by Captain H. F. Walters, 697 †
 Map of India and adjacent countries, On the Projection for a, by Colonel Gore, 577 †; note on, 473
 Maps: Government Surveys, 497 †, 594 †
 Missions de Wang Huen-ts'e dans l'Inde, par M. S. Lévi, 577 †
 Mohmand Field Force, Operations of the, compiled by Captain F. A. Hoghton, 123 †
 North-West Provinces and Oudh, Report on the Administration of the, 123 †
 Railway Connection with, by Sir T. Holdich, 444
 Sixty Years of Frontier Warfare, by Major A. C. Yate, 247 †
 South Indian Inscriptions, edited, etc., by E. Hultzsch, 487 †
 Survey of India Department, General Report of the Operations of the, 577 †
 Tochi Field Force, Operations of the, compiled by Major G. V. Kemball, 123 †
 Water of the Great Rivers of, Value of the, 366 †
 Western Glacis of India, 366 †
 Indian Ocean—
 Maps: Waarnemingen in den Indischen Ocean (K. Nederlandsch Meteorologisch Instituut), 498 †
 Indo-China—
 A travers l'Indo-Chine, Cochinchine, etc., par E. Lagrillière-Beaulerc, 122 †
 A travers le Tonkin: La rivière Claire, par G. Lhomme, 122 †
 Pavie Mission in, Results of, 473 †
 Mission Pavie Indo-Chine, III. Voyages au Laos, etc., par Captain Cupet, 248 †
 Trade of French Indo-China (Foreign Office Rep.), 577 †

- Indo-European Highway, An, by S. H. F. Capenny, 575 †
- In-Salah, Occupation d', par M. G. Demanche, 251 †
- Iowa—
 Constitution and Admission of Iowa into the Union, by J. A. James, 490 †
- Irân, The Cities of, by J. J. Modi, 698 †
- Irawadî river, silting of delta of, 241
- Ireland—
 Fauna and Flora of Valencia Harbour, 574 †
 Handbook for Travellers in, edited by John Cooke, 574 †
 Irish Peat Question, by T. Johnson, 695 †
 Reduced Ordnance Survey Map of, by J. Bartholomew, 262 †
- Iroquois Beach, The, by Prof. A. P. Coleman, 582 †
- Issel, A., Essai sur l'origine et la formation de la mer Rouge, 589 †
- Italian Somali Coast, condition and prospects of, 104
- Italy—
 Alpi Piemontesi, del V. Novarese, 485 †
 Annali Idrografici, 362 †
 Grotte e fenomeni carsici del Bellunese, del Dr. G. Dal Piaz, 571 †
 Handbook for Travellers in Central Italy, by Rev. H. H. Jeaffreson, 483 †
 Maps: Carte d'Italia (Istituto Geografico Militare), 135 †
 Monte Mario, Sulla latitudine di, nota di F. Giacomelli, 362 †
 Nero's Great Canal, etc., by A. Marks, 571 †
 Primi materiali per la storia della cartografia marchigiana di O. Marinelli, 572 †
 Produzione dell' acido borico . . . in Italia, del Prof. C. de Stefani, 571 †
 Southern, Trade of (Foreign Office Rep.), 244 †
 Tracce glaciali negli Abruzzi, del Dr. K. Hassert, 485 †
 Trade of (Foreign Office Rep.), 244 †
- Ivory Coast—
 Côte d'Ivoire, par Captain Thomasset, 124 †; note on, 104
 De la Côte d'Ivoire au Soudan, par E. Hostains, 348, 368 †
 Exploration et Captivité chez les Gouros, par M. J. Eyssérie, 251 †
 Port et le chemin de fer de la Côte d'Ivoire, par Commandant Houdaille, 580 †
- J.
- JACK, R. L., Photographs of the Yangtse Valley and Sechuén, 500 †
- Jacobi, Prof. H., How to calculate the lagna, 703 †
- Jäger, J., Steinach am Brenner, 483 †
- Jagor, Dr. Friedrich (Biography), 705 †
- Jamaica—
 Finances and Government of, Further Correspondence relating to, 372 †
 Geology and Geography of, by R. T. Hill, 354
 Handbook for 1900, by T. L. Roxburgh and J. C. Ford, 127 †
 Trade, etc., of (Colonial Rep.), note on, 355
- James, J. A., Constitution and Admission of Iowa into the Union, 490 †
- Janissa, Mount, Somaliland, 605
- Jankó, Dr. J., Ethnographic Researches in Siberia, 347
- Janssen, J., Sur l'observatoire du Mont Etna, 572 †
- Janssens, E., La participation des Néerlandais à la découverte de l'Australie, 127 †
- Japan—
 Bamboos, Cultivation of, by Sir E. Satow, 578 †
 Earthquake Investigation Committee, Publications of the, 578 †
 Hiogo and Osaka, Trade of (Foreign Office Rep.), 248 †
 Trade of (Foreign Office Rep.), 577 †; note on, 346
- Java—
 Facts and Fancies about, by Augusta de Wit, 123 †
 Regenkaart van Java, Een nieuwe, door Dr. J. P. van der Stok, 697 †
 Trade of (Foreign Office Rep.), 578 †
- Jeaffreson, Rev. H. H., A Handbook for Travellers in Central Italy, 483 †
- Jennings, A. V., The Geology of Bad Nauheim and its Thermal Salt-springs, 571 †
- Jerusalem ancienne, par T. Neville, 124 †
- Jibuti as a Port, M. L. Henrique on, 227
- Jiménez, J. V., Los ferrocarriles de Chile, 585 †
- Joalland, Lieut., expedition in the Lake Chad Region, 349
- Johnson, T., The Irish Peat Question, 695 †
- Johnston, W. and A. K., Map to illustrate the Chinese Question, 378 †; Plans of Paris and the Exhibition, 135 †; The Royal Atlas of Modern Geography, 498 †; War Map of the Orange Free State, 136 †
- Jokea and Biaru people, New Guinea, 271, 272
- Joly, J., An Estimate of the Geological Age of the Earth, 588 †; The Geological Age of the Earth, 373 †, 446
- Jones, J. A., The Devonian Iron Ores of Asturias, Spain, 245 †
- Jones, Joseph, A Thousand Miles up the Amazon, 490 †
- Jordan, W. L., Essays in Illustration of the Action of Astral Gravitation, 706 †
- Jorga, D. N., Documento geografice, 362 †
- Joutsen, O. A., Rakennustyyppejä Reski-Suomen pohjoisesta, 245 †

- Jumelle, H., *Les forêts et les essences forestières exploitables à Madagascar*, 369 †
- Jung, Dr. C. E., *Das Bewässerungssystem in Britisch-Indien*, 247 †
- Jura Mountains—
Recherches spéléologiques dans la chaîne du Jura, par Min. Fournier et Magnin, 244 †
- K.
- KACH tribe, Central Africa, 85
- Kagera river, Central Africa, 559, 560
- Kairuan, von H. Schurtz, 252 †
- Kalabit district, Borneo, 51
- Kala-i-Bar-Panja, Shugnan, 679
- Kalo, New Guinea, 288
- Kambata hot Springs, Galla Country, 296
- Kamchatka, M. Bogdanovich's Expedition in, 222
- Kamerun (*see also* Cameroons)—
 Erläuterungen zu meinen Reisen in Süd-Kamerun, von Oberleutnant v. Stein, 368 †, 562
 Küstengebiet von Kamerun, von Dr. E. Esch, 580 †
 Maps: Das Konzessionsgebiet der Gesellschaft Nordwest-Kamerun, von M. Moisel, 379 †
 Regenermessungen aus Kamerun, von H. Matzat, 251 †
- Kampffmeyer, G., *Material zum Studium der arabischen Beduinendialekte Innerafrikas*, 581 †
- Kan, C. M., *Les colonies Néerlandaises dans les Indes Occidentales*, 372 †; *Les études scientifiques concernant les possessions Néerlandais aux Indes Orientales*, 365 †
- Kandt, Dr. R., *Bericht über meine Reise . . . in Deutsch-Ostafrika*, 580 †; note on, 559
- Kannenberg, Hauptmann, *Reise durch die hamitischen Sprachgebiete um Kondoa*, 368 †
- Kansas—
 Gazetteer of, by H. Gannett, 583 †
- Karas river, Pamirs, 665
- Kashmir—
 Ancient Geography of, Memoir on Maps illustrating the, by M. A. Stein, 487 †
 Besteigung des Karsongpasses, von H. Francke, 697 †
- Kasr Dakhil, 660
- Katanga, Au, la traversée des monts Kibala, 249 †
- Katua tribe, East Central Africa, 616
- Keller, A., *Voyage au mont Sinai*, 578 †
- Keller, H., *Memel-, Pregel- und Weichselstrom*, 570 †
- Keltie, Dr. J. Scott, and I. P. Renwick, *The Statesman's Year-Book*, 134 †
- Kelton, M. E., *Apperception in Geography*, 376 †
- Kemball, Major G. V., *Operations of the Tochi Field Force*, 123 †
- Kemeid, H. J., *Cairo and Egypt and Life in the Land of the Pharaohs*, 699 †
- Kennion, Captain, remarks on "Journeys in Central Asia," 524
- Kent—
 Philips' County Readers, Kent, Past and Present, by G. F. Bosworth, 693 †
- Kenya, Mount—
 A Journey to the Summit of, by H. J. Mackinder, 124 †
 Ascent of, by H. J. Mackinder, 249 †
 Geology of, by Prof. J. W. Gregory, 249 †
- Kerp, H., *Der Einfluss der Ei-zeit auf das Natur- und Kulturbild der skandinavischen Länder*, 120 †
- Kesin Pass, Central Asia, 520
- Khandar Dawan, Central Asia, 507
- Kharjah, Oasis of, 655, 659
- Khorassan, Trade of (Foreign Office Rep.), 248 †
- Khotan river, Central Asia, 506
- Kiauchau—
 Kiautschou, 576 †
- Kihlman, A. O., *Pflanzen-phänologische Beobachtungen in Finland*, 363 †
- Kilimanjaro—
 Kilimandscharo-Besteigung bis zu 5500 m. Höhe, von A. Widenmann, 488 †
 Reisen und Studien, von Dr. Hans Meyer, note on, 352
- Kilwa Kisiwani, East Africa, 561
- Kimberley—
 Climate of Kimberley, Do the mining operations affect the, by J. R. Sutton, 367 †
 Winds of, by J. R. Sutton, 367 †
- Kimsonoi river, Sotik country, 82
- Kindberg, N. C., *Nya bidrag till Vermlands och Dals bryogeografi*, 246 †
- Kinder, C. W., *Map showing the Imperial Railways of North China*, 378 †
- King, Major J. S., *History of the Bahmani Dynasty*, 365 †
- Kingsley, Miss Mary H., obituary of, 114
- Kiria river, Central Asia, 504
- Kiriwina people, New Guinea, 271
- Kishlags of the Shugnans, 676, 677
- Kiukiang, Trade of (Foreign Office Rep.), 576 †
- Kiungchau, Trade of (Foreign Office Rep.), 576 †
- Kivu, Lake, Central Africa, 168; Volcanoes near, 170, 172
- Kivu Region, Congo-German Frontier in the, 105
- Klondike—
 Chemin de fer du Klondyke, par G. Labadie-Lagrave, 252 †
 Gold Fields of, Preliminary Report on, by R. G. McConnell, 370 †; note on, 687
- Klose, Heinrich, *Togo unter Deutsche Flagge*, review, 106
- Knapp, C., und M. Boral, *Geographisches Lexikon der Schweiz*, 573 †

- Knibbs, G. H., Observations on the Determinations of Drought-Intensity, 588 †
- Knott, Prof. C. G., The Propagation of Earthquake Vibrations through the Earth, 704 †
- Knox, A., Geographical Index to Books, Periodicals, etc., 495 †
- Knudsen, Dr. M., Ein hydrographischer Lehrsatz, 589 †; On the physical and chemical constants of sea-water, 445
- Koettlitz, R., A Journey through Somaliland and Southern Abyssinia, 581 †, 700 †
- Köhler, E. M., Kritische Studien zur Bevölkerungsfrage Chinas, 122 †; note on, 100
- Kohlschütter, Dr., and Lieut. Glauning, Pendulum Expedition in East Africa, 352
- Koi-Tezek, Mount, Shugnan, 669
- Kolthoff, Prof., expedition in East Greenland, 566
- Komati river, South-East Africa, M. A. Grandjean on the system of the, 350
- Korea—
Corée: Le port de Ma-San-Pho, par A. A. Fauvel, 697 †
Korea—the Hermit Nation, by Commander H. Webster, 248 †
Korea, the Pearl of the Orient, by Charlotte M. Salwey, 366 †
- Kornerup, T., Aperçu des "Meddelelser om Grönländ," 373 †
- Kosova tribe, Central Africa, 80, 86
- Kosova Vilayet, Dr. Karl Oestreich on the geography of, 222
- Kozloff, M., Expedition to Mongolia, 100
- Krahmer, General, Bogdanowitsch' Ochotskisch-Kamtschatkasche Bergexpedition, 366 †
- Krämer, Dr. A., Die angeblichen Hebungen und Senkungen in Samoa, 255 †
- Kremsier, V., Die klimatischen Verhältnisse des Memel-, Pregel- und Weichsel-Gebietes, 570 †
- Kropotkin, P., Baron Toll on New Siberia and the Circumpolar Tertiary Flora, 95
- Krüger, Dr. Paul, Die chilenische Reñihué-Expedition, 372 †, 585 †
- Kubary, J., Beitrag zur Kenntniss der Nukuoro oder Monteverde-Inseln, 491 †
- Kungur mountain, Pamirs, 522
- Kuramat Dawan, Central Asia, 519
- Kurse, Dr. G., Die Samoaner in der heidnischen Zeit, 255 †
- Kush, Afghanistan, 682
- Kyrrillos II., S. B. Monseigneur, Le temple du Césaréum, 249 †
- L.
- LABADIE-LAGRAVE, G., Le Chemin de fer du Klondyke, 252 †
- Labrador—
Explorations in, by A. P. Low, 686
- Ladoga, Lake—
Lac Ladoga au point de vue thermique, par M. Jules de Schokalsky, 694 †; note on, 471
- La Ferrière fortress, Haiti, 313, 314
- Lagerborg, R., Finland i utländsk historisk literatur, 363 †
- Lagna, How to calculate the, by Prof. H. Jacobi, 703 †
- Lagos, Report for 1898 (Colonial Reports), 368 †
- Lagrillière-Beauclerc, E., A travers l'Indo-Chine, Cochinchine, etc., 122 †
- Lake, P., Bala Lake and the River System of North Wales, 364 †
- Lake, Philip, on the River System of North Wales, 679
- Lamprecht, K., Ueber Historische Grundkarten, 492 †
- Lanak La, Tibet, 142
- Land-Forms, Origin of, through Crust-Torsion, by M. M. Ogilvie Gordon, 457 *
- Lane, A. C., The Geothermal Gradient in Michigan, 371 †
- Langhans, Dr. Paul, Buren in Deutsch-Südwest-Afrika, 251 †; Die wirtschaftlichen Beziehungen der deutschen Küsten zum Meere, 135 †, 361 †; note on, 220
- Lans, Kap., Zur Küstenkunde von China, 486 †
- Lantern Slides of Maps, "Diagram" Series of, by B. Dickenson and A. Andrews, 709 †
- Laporte, Commandant, Carte de la Nouvelle Calédonie, 595 †
- Lapparent, A. de, L'œuvre de M. Suess, 373 †; Sur la symétrie tétraédrique du globe terrestre, 130 †
- Las Heras or Baker River, Patagonia, 206
- Lata river, Borneo, 43
- Latham, B., The climatic conditions necessary for the propagation and spread of plague, 591 †
- Latitude—
Determinazione astronomica di latitudine e di azimut eseguita a Monte Pisarello, del Prof. V. Reina, 256 †
Stand der Erforschung der Breitenvariation am Schlusse des Jahres 1899, von T. Albrecht, 256 †
- La Touche, T. D., Preliminary Report on the Geology of the Northern Shau States, 577 †
- La Vaulx, Comte Henry de, Voyage en Patagonie, 372 †
- Leblond, M., Mahé de La Bourdonnais, 132 †
- Lecce, Province of, Trade of the (Foreign Office Rep.), 572 †
- Lechartrie, M. G., Cartes agronomiques du canton de Redon, 243 †
- Leclercq, J., Anurádhapura sous les rois cinghalais, 575 †; Le septième congrès international de géographie à Berlin, 134 †, 260 †; Les Boers et leur état

- social, 700 †; Un séjour dans l'île de Ceylan, 696 †
- Leclère, A., Géographie générale des provinces Chinoises voisines du Tonkin, 122 †
- Lecoq, G., Aperçu des travaux scientifiques de l'expédition antarctique belge, 492 †; L'hydrographie dans le détroit de la *Belgica*, 492 †; Expédition Antarctique Belge, 128 †
- Lecoq, Lieut. G., und Capt. A. de Gerlache (Biography), 705 †
- Lee, J. Bridges, Photographic Surveying, 256 †
- Lee, Sidney, Dictionary of National Biography, 132 †, 494 †
- Leghorn and Auenra, Trade of (Foreign Office Rep.), 244 †
- Lehr, F., Das Präzisions-Nivellement in der österreichisch-ungarischen Monarchie, 483 †
- Lejeaux, A., Notice Historique succincte sur la Cartographie, 587 †
- Lemaire, Capt., L'expédition Lemaire aux sources du Congo, 249 †; Expedition across Africa from the Zambezi to the Congo mouth, 684
- Lemström, S., On the earth-currents and the electrical currents in the atmosphere, etc., 375 †
- Lemström, S., and J. Dannholm, On the variations in the velocity of Winds, 588 †
- Lenz, O., Fortschritte der geographischen Forschungen und Reisen im 1899.. 579 †
- Leon, Diego Flores de, voyage of, 18
- Léontieff, Comte de, Exploration des provinces équatoriales d'Abyssinie, 579 †; Expedition to Lake Rudolf, 103, 558
- Leopoldville and Stanley Pool—
Entwicklung von Leopoldville am Stanley Pool, 699 †
- Leprince, J., Les Simons, sorciers de la Guinée française, 250 †
- Lespagnol, M. G., La conception actuelle de la Géographie, 260 †
- Leval, G. de, La Chine d'après des auteurs récents, 122 †
- Levant—
Puissances étrangères dans le Levant en Syrie et en Palestine, par M. M. Verney et Dambmann, 579 †
- Levasseur, E. M., Comparaison du travail à la main et du travail à la machine, 260 †
- Levêque, M., Le Zambèze et le Shire, 369 †
- Leverett, F., The Illinois Glacial Lobe, 490 †
- Lévi, S., Les Missions de Wang Hiuentse dans l'Inde, 577 †
- Levy, V., Die Grundlagen des französischen Protectorates in Tunesien, 700 †
- Lhomme, G., A travers le Tonkin: La rivière Claire, 122 †
- Liao-tung—
Russian Territory on the Liao-tung Peninsula, by E. Bretschneider, 486 †
- Library of R.G.S., Subjects Catalogue, 3
- Li-kiang, Sechuen, 534
- Limnology—
Investigations on Lake Ladoga, by Colonel J. de Shokalsky, 471
- Lindman, C. A. M., Vegetationen i Rio Grande do Sul, 127 †
- Lisbão, João de, 627
- Little, A. J., The Yangtze Valley and the British Sphere, 247 †
- Livingstone, Dr., Memorial to, 6
- Liznar, J., Einige Bemerkungen zur Messung der Horizontalintensität des Erdmagnetismus, 589 †
- Lloyd, A. B., In Dwarf Land and Cannibal Country, 369 †
- Lob Nor Region, Dr. Sven Hedin's explorations in the, 345, 472, 598
- Locamus, P., Carte de Madagascar, 136 †, 595 †
- Loch, Lord, Obituary of, 236
- Logan, W. N., A North American Epicontinental Sea of Jurassic Age, 582 †
- Loire—
Navigabilité de la, par M. V. Doby, 360 †
- Loka tribe, Gallaland, 300
- Lolos of Sechuen, 535
- Lomami river, Congo Region, 562
- Lombardy, Trade of (Foreign Office Rep.), 244 †
- Lombok, Strait of, depths in the, 551
- London—
London and its Environs, Handbook for travellers by Karl Baedeker, 574 †
- University, Geography at, 112
- London and Edinburgh, Barometric and Thermometric Gradients between, by R. C. Mossman, 364 †
- Long Kin Hole, by F. Ellet, 246 †
- Lorin, H., Le Soudan français, 250 †
- Lorraine, Un coin de, par M. A. Merchier, 570 †
- Low, A. P., Explorations in Labrador, 686
- Lubbock, Sir J., On the Configuration of the Earth's Surface, 257 †
- Ludwig Salvator, The Archduke, Die Insel Giglio, 572 †
- Lukchun—
Klima von Luktshun, von A. Woeikof, 365 †
- Lumbwa country and people, Central Africa, 79, 84
- Lumholtz, Carl, Symbolism of the Huichol Indians, 582 †
- Luschan, F. v., R. Parkinson's Beobachtungen auf Bóolo und Hün, 703 †
- Lyakhovski island, New Siberia, 96
- Lyautey, Colonel, de l'emploi de la main-d'œuvre militaire à la construction des voies de communication, 591 †
- Lyburn, E. St. John, Mining and Minerals in the Transvaal and Swaziland, 700 †
- Lyons Geographical Society—
Société de Géographie de Lyon et de la Région Lyonnaise, 260 †

M.

- McADIE, A. G., and G. H. Willson, The Climate of San Francisco, California, 126 †
- Mac Alister, D. A., The Emerald Mines of Northern Ethai, 537 *
- McCarthy, James, Surveying and Exploring in Siam, 578 †
- McClintock, Admiral, Remarks on The Southern Cross Expedition to the Antarctic, 413
- McConnell, R. G., Preliminary Report on the Klondyke Gold Fields, 370 †; note on, 687
- McCormick, Rev. W. T., Two Thousand Miles through South Africa, 581 †
- Macdonald, Lieut.-Colonel, Notes on the Ethnology of Tribes met with during progress of the Juba Expedition, 580 †
- Macdonald, —, Trade of Servia (Foreign Office Rep.), 245 †
- Macedonia—
- Macedonischen Seen, von Prof. J. Cvijić, 246 †
- Macedonia and Southern Albania, Dr. J. Cvijić's Researches in, 215
- Macgregor, —, Trade of Stockholm and Eastern Coast of Sweden, 246 †
- Mackinder, H. J., The Ascent of Mount Kenya, 249 †; A Journey to the Summit of Mount Kenya, 124 †; Orographical map of Europe, 593 †
- Maclaud, Dr. La Guinée française, 250 †
- McMahon, Lieut.-General, C. A., Notes on the Geology of Gilgit, 365 †
- McMahon, W., A Journey with the Sun around the World, 592 †
- McMaster, Mr., Report on Beira and District, 351
- Macoun, J., Catalogue of Canadian Birds, 370 †
- Macquarie Harbour, its Physical Aspect and Future Prospects, by C. N. Bell, 586 †
- "Madaba" mosaic map, 328
- Madagascar—
- Délégation à Madagascar de MM. A. Boegner et P. Germond, Rapport sur la, 581 †
- Études géographiques à Madagascar, 581 †
- Forêts et les essences forestières exploitables à Madagascar, par H. Jumelle, 369 †
- Guide de l'Immigrant à Madagascar, 581 †
- Hova sont-ils des Malais? par M. E. F. Gautier, 369 †
- Madagascar au point de vue économique, par M. Lallier du Coudray, 251 †
- Maps: Carte de, par P. Locamus, 136 †, 595 †
- Position géographiques . . . sur la côte orientale de Madagascar, par P. Colin, 368 †
- Travaux publics et le chemin de fer de Madagascar, 251 †
- Madagascar—continued.
- Voyage de la Reine Ranavalona I^{re} à Mananirina, par G. Grandidier, 369 †
- Madang country, Borneo, 40, 42; People of, 46
- Madras—
- Geological Sketch of the Central Portion of Jeypore Zemindari, by T. L. Walker, 487 †
- Presidency, Report on the Administration of the, 247 †
- Madrolle, C., Atlas de l'Empire Chinois, 262 †
- Magellan's Straits, 14
- Magnetic Influence of the Sun on the Earth and on Comets, by A. Harvey, 588 †
- Magnetic Instrument—
- Ergänzungen zu meinem magnetischen Reise-Theodolith, etc., von H. Wild, 256 †
- Magnetic Pole, South, position of, 412
- Magois tribe, East Central Africa, 613
- Maguire, T. M., The Strategic Geography of Europe, etc., 119 †
- Mahé de La Bourdonnais, par M. Leblond, 132 †
- Maine—
- Glacial Gravels of, by G. H. Stone, 583 †
- Makarov, Vice-Admiral, The Yermak Ice-Breaker, 260 †; On some Oceanographic Problems, 589 †
- Malabar, Notes on some of the People of, 247 †
- Malaga and District, Trade of (Foreign Office Rep.), 245 †
- Malakand Field Force. The Operations of the, by Captain H. F. Walters, 697 †
- Malaria—
- Etiologie, le diagnostic . . . de la Malaria, par Dr. A. Poskin, 591 †
- Malaria d'après les dernières recherches des Italiens, par Dr. A. Broden, 134 †
- Paludismul din punct de vedere geografic, de Dr. J. Stefănescu, 375 †
- Malavialle, L., La carte de l'Inde d'après Pomponius Mela, 365 †
- Malay Archipelago—
- Doif-eilanden door A. Wichmann, 366 †
- Siboga-Expeditie, De, 366 †; Results of the Dutch Siboga Expedition, 549
- Siboga, Cruise and Deep-sea Exploration of the, 697 †
- Malay Peninsula, Expedition in the, under Mr. W. W. Skeat, 345
- Malay States—
- Siamese Malay States, by N. Annandale, 698 †
- Malotet, A., Le Cambrésis, 570 †
- Mamakul Pass, Central Asia, 514
- Manchuria—
- Newchwang, Trade of (Foreign Office Rep.), 122 †
- Railways, Rivers, and Strategic Towns in, 576 †

Manchuria—continued.

Russia's Sphere of Influence; or, a Thousand Years of Manchuria, by E. H. Parker, 122 †

Manés, M. J., Les vingt-cinq années de la Société de géographie commerciale de Bordeaux, 259 †

Mangstza lake, No. 1 Peak, Tibet, 142

Mañuales river, Patagonia, 201

Manley, J. J., and R. T. Günther, On the Waters of the Salt Lake of Urmi, 123 †

Mapia Islands—

Les îles Mapia, 373 †

Mapia-oder Bunai-Inseln, von Prof. Dr. A. Wichmann, 127 †

Map Areas, Measurement of—

Genauigkeit der Flächenangaben in der Geographie, von Prof. Dr. E. Hammer, 129 †

Map-reading—

Einiges über Kartenlesen, von Herr Obermair, 256 †

Map Slides—

"Diagram" Series of Geographical Lantern Slides of Maps, by B. Dickenson & A. Andrews, 709 †

Maps—

Bevölkerungstatistische Grundkarten, von Prof. Dr. A. Hettner, 129 †

Cartography of the Terra Australis and New Holland, by J. B. Walker, 590 †

Foreign Topographic Maps, by Colonel Sir J. Farquharson, 129 †

New Light on some Mediæval Maps, by C. R. Beazley, 319 *, 375 †, 705 †

Randteckningar i gamla handskrifter af Datis La Sfera, af A. E. Norden-skiöld, 132 †

Wechselnden Phasen im geschichtlichen Sehkreis occidentalischer Cultur, 494 †

Maps, New—

Africa, 136, 262, 378, 595, 708

America, 137, 263, 379, 498, 595, 709

Asia, 136, 262, 378, 497, 594, 708

Australasia, 379

Charts, 138, 499, 595, 711

Europe, 134, 261, 377, 496, 592, 707

General, 137, 263, 379, 498, 709

Marcet, Dr. William, by Dr. F. W. Tunncliffe, 132 †

Marco Polo, by Paul Chaix, 494 †; Marco Polo's Itinerary through Persia, Captain Sykes on, 472 †

Mardon, E. J., Photographs of East Africa, 140 †

Marine Deposits—

Analyse de fonds marins recueillis dans l'Iroise, par M. J. Thoulet, 258 †

Marine Economy of the German Coasts, Dr. P. Langhans on, 220

Marinelli, Giovanni (Biography), 259 †; by Prof. G. Dalla Vedova, 495 †

Marinelli, O., Conche lacustri dovute a suberosioni nei gessi in Sicilia, 362 †; on Geographical and Geological Ter-

minology, 113; Idee morfologiche di Carlo Gemmellaro, 257 †; Primi materiali per la storia della cartografia marchigiana, 572 †; Superficie geologiche e superficie geografiche, 260 †

Mariong valley, Central Asia, 508

Markham, Sir C. R.—

Address to the R.G.S., 1 *

Address on opening Session 1900-1901 .. 597

Die Aufgaben der geplanten Südpolar Expeditionen, 128 †

Remarks on: "An Expedition between Lake Rudolf and the Nile," 624; "In the Heart of Borneo," 59, 62; "Journeys in Central Asia," 523, 526; "King Menelek's Dominions, etc.," 304, 306; "Methods of Survey Employed by the Chilean Boundary Commissions," 345; "Patagonian Cordillera and its main rivers," 209, 210; Presenting Medals, etc., 115, 116; *Southern Cross Expedition to the Antarctic*, 411, 413; "Studies in the Anthropogeography of British New Guinea," 441; "Through Africa from the Cape to Cairo," 183, 184

Marks, A., Nero's Great Canal, etc., 571 †

Morocco—

Casablanca, Bearbeitet nach dem Reisebericht S.M.S. *Charlotte*, 369 †

Études géographiques sur le Maroc, par Dr. Weisgerber, 369 †

Fez à l'Oranie à travers le pays des Ghiata, De, par G. Delbrel, 581 †

Itinéraires de Mogador à Marrakech, par H. Giraud, 369 †

Mogador, Bearbeitet nach dem Reisebericht S.M.S. *Charlotte*, 369 †

Morocco Scare, The, by W. B. Harris, 581 †

Marr, John E., The Scientific Study of Scenery, Review, 112; on Moels, 446

Marriott, J. A. R., Sir W. W. Hunter and his Work, 259 †

Marseilles—

Marseille port colonial, par P. Masson, 360 †

Port franc à Marseille, etc., par J. Estrine, 360 †

Marson, Prof. L., Sui ghiacciai italiani del gruppo del Pizzo Bernina, 483 †

Martel, E. A., L'Aven Armand, les Grottes de Ganges, les Gouffres de Sauve, 243 †; Padirac, Etude d'hydrologie souterraine, 360 †; La Spéléologie ou Science des Cavernes, 374 †; Sur de nouvelles constatations dans la rivière souterraine de Padirac, 484 †

Martin Behaim—

Martin de Bohemia (Martin Behaim), por E. G. Ravenstein, 590 †

Martinique, Trade of (Foreign Office Rep.), 585 †

Martonne, E. de, Sur la période glaciaire dans les Karpates méridionales, 362 †; Sur l'histoire de la vallée du Jiu, 362 †

- Martonne, M. de, et M. Murgoci, Sondage et analyse des boues du lac Galcescu, 120 †
- Mascardi, Lake, Patagonia, 36
- Masclef, A., La Géographie botanique et son évolution au XIX^e siècle, 493 †, 704 †
- Maasero, G., The Passing of the Empires, 850 B.C. to 330 B.C. . . 705 †
- Massachusetts—
Geology of Eastern Berkshire County in, by B. K. Emerson, 583 †
- Masson, P., Marseille port colonial, 360 †
- Matabeleland—
Matabele Campaign of 1896, by Colonel R. S. S. Baden-Powell, 249 †
- Mathew, Rev. John, on the Australian Aborigines, 229
- Mathews, E. B., The Granitic Rocks of the Pikea Peak Quadrangle, 583 †
- Mathews, R. H., Divisions of the South Australian Aborigines, 373 †; Native Tribes of Western Australia, 373 †
- Matteucci, Prof. R. V., Photographs showing Eruption of Mount Vesuvius, 264 †
- Matthew Paris' ancient Maps, 319-326
- Matzat, H., Regenmessungen aus Kamerun, 251 †
- Maudslayi, A. P., Biologia Centrali-Americana, Archæology, 372 †
- Mauler, Captain J. von, Explorations in the Solomon Islands, 230
- Maurain, E., Reconnaissance de l'arc du méridien de Quito, 491 †; note on, 356
- Maurain and Lacombe, Captains, Geodetic Work of, in Ecuador, 356
- Maurer, Dr. H., Prüfung eines neuen Anemometers, 257 †; Resultate . . . meteorologischer Registrirapparate in Deutsch-Ostafrika, 580 †
- Maxwell, Sir H., Names of Places, 261 †; The Valley of Enchantment, 572 †
- Mayer river, Patagonia, 208
- Mayr, Dr. A., Pantellaria, 244 †
- Mead, E. D., The Expansion of England, 495 †
- Mead, Elwood, Rise and Future of Irrigation in the United States, 490 †
- Meade, Lieut.-Colonel, The Trade of the Persian Gulf (Foreign Office Rep.), 578 †; note on, 682
- Medal of the Queensland Branch of the Royal Geographical Society of Australasia, 568
- Medals and Awards of the R.G.S., Presentation of, 115
- Medical Geography—
Influence des températures élevées sur l'organisme humain, par Dr. A. Broden, 591 †
- Mediterranean Region—
Variations des limites de la région méditerranéenne, par M. G. Bonnier, 245 †
- Meetings of R.G.S., Session 1899-1900. . . 115, 241, 693
- Meinardus, Dr. W., Eine einfache Methode zur Berechnung klimatologischer Mittelwerthe von Flächen, 493 †
- Mekeo District, British New Guinea, 271 †; People of, 275
- Melanesia—
Amongst Tropical Islands, by Hannu Chewings, 491 †
- Parkinson's Beobachtungen auf Bobu und Hün, von F. v. Luschau, 703 †
- Melbourne, Mount, Antarctic, 397
- Melbourne to Tokio, Notes by the Way, W. Daish, 486 †
- Melville, E. H. V., Map of the Vereenignin Pretoria portion of the Transvaal, 378 †
- Menelek's Dominions and the Count between Lake Gallop (Rudolf) and the Nile Valley, by the late Captain Wellby, 292 *
- Menendez, Father Francisco, journeys of, 22
- Merchier, A., Un coin de Lorraine, 570
- Merlin, —, Trade and Agriculture of Thessaly (Foreign Office Rep.), 244 †
- Merritt, W. H., Field Testing for Gold and Silver, 495 †
- Mersey, River, Report on the Present State of the Navigation of the, by S. G. S. Nares, 364 †
- Meteorological Congress—
Atti del IV. Congresso Meteorologico Italiano, 260 †
- Meteorology—
Kite Work of the Weather Bureau, by H. C. Frankenfield, 257 †
- Note sur le dépouillement des journaux météorologiques des bâtiments de commerce, 493 †
- Prüfung eines neuen Anemometers, von Dr. H. Maurer, 257 †
- Temperatur der freien Atmosphäre, von Dr. H. Hergesell, 374 †
- Wichtigsten Bergobservatorien, von F. Erk, 374 †
- Wo ist der höchste Luftdruck der Erde, mit und ohne Reduktion auf das Meeres-niveau? von A. Woeikof, 374 †
- Mexico—
Cordillera of, by O. H. Howarth, 371 †
- Deutschum in Mexiko, 582 †
- Folklore of, Catalogue of a Collection of Objects illustrating the, by F. Starr, 489 †
- Geographical Sketch of (Bureau of American Republics), 489 †
- Huichol Indians, Symbolism of the, by Carl Lumholtz, 582 †
- Rio Del Fuerte of Western Mexico and its Tributaries, by K. D. Doyle, 582 †
- Mexico and Guatemala—
Aufalten Wegen in Mexiko und Guatemala, von C. Seler, 701 †
- Meyer, Dr. Hans, Der Kilimanjaro, Reisen und Studien, Note on, 352
- Meyer, Dr. Hermann (Biography), 132 †
- Mfumbiro, Mount, Central Africa, 172, 184, 228, 560

- Michel, C., Résultats géographiques de la mission de Bonchamps, 487 †; note on, 476
- Michigan—
Crystal Falls Iron-bearing District of, by J. M. Clements and H. L. Smyth, 371 †, 583 †
Geothermal Gradient in, by A. C. Lane, 371 †
Preglacial Drainage in, Further Notes on, by E. H. Mudge, 583 †
- Middlemiss, C. S., Report on a geological reconnaissance in parts of the Southern Shan States, 577 †
- Mill, Dr. H. R., Fragment of the Geography of England, 246 †; Development of Habitable Lands, 131 †; New Lands: their Resources and Prospective Advantages, 592 †; note on, 568; Pettersson-Nansen Insulating Water-bottle, 446, 469; Town Sites, from a Geographical Point of View, 590 †
- Miller, A. M., Swaziland, 251 †
- Miller, Dr. Konrad, Die Ebstorkkarte, 131 †
- Millspaugh, C. F., Plantæ Utowanæ, 702 †
- Milne, Prof. J., Large Earthquakes recorded in 1899, 443
- Mines and Quarries: General Report and Statistics, edited by C. Le Neve Foster, 258 †
- Minnesota—
Geological and Natural History Survey of, 126 †
Gneisses . . . of South-Western Minnesota, by C. W. Hall, 583 †
- Mississippi—
Reaction Breakwater of the, by L. M. Haupt, 583 †; note on, 477
South-west Pass of the, Proposed Improvement of the, 477
- Missouri—
Fossil Flora of the Lower Coal Measures of, by D. White, 583 †
- Moaripi people, New Guinea, 271
- Modi, J. J., The Cities of Irân as described in the old Pahalavi treatise of Shatrôihâ-i-Irân, 578 †, 698 †; The Etymology of a few towns of Central and Western Asia, 485 †
- Moe, O. F., Miuder fra Alaska, 489 †
- Mogador, Bearbeitet nach dem Reisebericht S.M.S. *Charlotte*, 369 †
- Mohn, H., Klima-Tabeller for Norge, 362 †
- Moisel, M., Das Konzessionsgebiet der Gesellschaft Nord-west-Kamerun (map), 379 †
- Monaco, Prince de, Résultats des Campagnes Scientifiques accomplies sur le Yachte de, 588 †
- Monckton, G. F., Mining Districts near Kamloops Lake, British Columbia, 125 †
- Moncousin, M. P., Notes sur les Tehuelches, 253 †
- Mongolia—
Expedition to, under M. Kozloff, 100
Orkhon, Inscriptions de l', par E. H. Parker, 247 †
- Mont Blanc—
Chemin de fer du pied au sommet du Mont-Blanc, par J. et H. Vallot, 360 †
- Monteil, Colonel, Conférence sur le Domaine colonial de la France, 376 †
- Moore, Mr., Expedition to the Central African Lakes, 228
- Moos, N. A., A Short Note on the Disturbance of the Magnetical . . . Instruments at the Colaba Observatory, 577 †
- Moraleda, Don José de, journey in Patagonia, 21
- Moran, Cardinal, on Quiros and the Discovery of Australia, 479
- Moravian Missions, Periodical Accounts relating to, 376 †
- Morren, F. W., La Culture du Café au Guatemala, 254 †
- Morse, L., Photographs taken in Mongolia and Russian Central Asia, 380 †
- Mossman, R. C., Barometric and Thermometric Gradients between London and Edinburgh, 364 †
- Motu tribe, New Guinea, 416
- Mountaineer's Equipment, Catalogue of, 261 †
- Moxly, Rev. J. H. S., The New Theory of Tide, 705 †
- Mozambique and Quilimane, Trade of (Foreign Office Rep.), 251 †
- Msimanga, Mount, Central Africa, 559
- Mudge, E. H., Further Notes on Preglacial Drainage in Michigan, 583 †
- Mudirieh of Assyut, The Oases of the, by A. R. Guest, 655
- Mulhall, M. G., Imports and Exports of 40 Years (United Kingdom), 364 †
- Müller, F. Max, The Sacred Books of the East, 591 †
- Mulu Mount, Borneo, 39, 57
- Murray, John, Handbook for Travellers in Greece, 485 †; Handy Classical Maps, edited by G. B. Grundy, 134 †, 496 †, 498 †; note on, 234
- Murray and Kimens, Messrs., Trade of Poland and Lithuania, 363 †
- Murray, Sir John, Presidential Address to Section E, Brit. Association, 374 †
- Murray, Sir John, and F. P. Pullar, A Bathymetrical Survey of the Fresh-water Lochs of Scotland, 121 †, 246 †
- Mursu and Murle Tribes, East Central Africa, 609
- Mut, Oasis of Dakhilah, 659, 660
- Müttrich, Dr., Ueber den Einfluss des Waldes auf die Lufttemperatur, etc., 588 †
- Muz Tagh Ata, Central Asia, 508, 524
- Mweru, Lake, Mr. Weatherley's observations on, 475

N.

- NAIVASHA Lake, Journey from, to the Victoria Nyanza, by Captain G. H. Gorges, 78 *, 487 †

- Nansen, Dr., and his Scientific Results, by E. Plumstead, 256 †; observations of, 109
- Nansen, Dr., and Prof. Pettersson, Insulating Water-bottle of, 469
- Nares, Sir G., Relics of Arctic Expedition of, 109; Report on the Present State of the Navigation of the River Mersey, 364 †
- Narragansett, Basin, Geology of the, by N. S. Shaler, J. B. Woodworth, and A. F. Foerste, 583 †
- Nathorst, A. G., Den svenska expeditionen till nordöstra Grönland, 492 †; Om myskoxen och myskoxjagter på Ost-Grönland, 587 †; Ueber die oberdevonische Flora der Bären Insel, 586 †
- Nautical Almanac and Astronomical Ephemeris for 1903... 256 †
- Navigation—
Self-instruction in the Practice and Theory of, by the Earl of Dunraven, 703 †; note on, 690
- Nebraska—
Geology and Water Resources of, by N. H. Darton, 371 †
Glacial Grooves and Striae in, by E. H. Barbour, 584 †
- Nebular Hypothesis, An attempt to test the, by T. C. Chamberlin, 129 †
- Negri, E., Lo stato di Minas Geraes nel Brasile, 127 †
- Nerman, G., Studier öfver vattenförhållandena i svenska sjöar, 246 †
- Nero's Great Canal, etc., by A. Marks, 571 †
- Netuschill, F., Die astronomischen Gradmessungsarbeiten des k. u. k. militärgeographischen Institutes, 483 †
- Neuhaus, G., Der Obstreichthum der Insel Zanzibar, 487 †
- Neve, Dr. E., The Ascent of Haramouk, 365 †
- Neville-Rolfe, —, Trade of Southern Italy (Foreign Office Rep.), 244 †
- Neville, T., Jérusalem ancienne, 124 †
- New Britain—
North Coast of, Herr v. Bennigsen's visit to, 565
South Coast of, Dr. Schnee's voyage along the, 107
- New Caledonia—
Colonisation en Nouvelle-Calédonie, par M. L. de Sainte-Marie, 373 †
Maps: Carte de la Nouvelle Calédonie, par Commandant Laporte, 595 †
- Newchwang, Trade of (Foreign Office Rep.), 122 †, 576 †
- Newell, F. H., Report of Stream measurements (U.S. Geological Survey), 372 †
- New Guinea—
British: Annual Report, 107; Anthropogeography of, Studies in the, by Prof. A. C. Haddon, 265*, 414*; Customs, Arts, and Crafts in, 417-437; Photographs of scenery in vicinity of Kemp Welsh River in, by R. E. Guise, 596 †; Report for 1898-99 (Colonial Rep.), 703 †
- German: Bericht über eine Bereisung Neu-Mecklenburgs, 585 †
- Klima von Neu Guinea, von Dr. A. v. Danckelman, 255 †
- New Lands: their Resources and Prospective Advantages, by H. R. Mill, 592 †; review, 56*
- Newman, George, Bacteria, especially as they are related to the economy of nature, etc., 706 †
- Newnes Land, Antarctic, 401
- New Orleans and District, Trade of (Foreign Office Rep.), 253 †
- New Siberia Islands, expeditions to, under Baron Toll and M. Volossowitch, 232, 567; and the Circumpolar Tertiary Flora, Baron Toll on, by P. Kropotkin, 95
- New South Wales—
Darling River, Rapid Preliminary Surveys on the, by W. Poole, 255 †
- Mercury or "Quicksilver" in, by J. E. Carne, 491 †
- Rain... Observations made in, Results of, by H. C. Russell, 586 †
- Rock Temperatures, Records of, by Ræ, Pittman and David, 586 †
- Statistical Register, 255 †
- Statistics, History, and Resources, 585 †
- Trawling Expedition of H.M.C.S. *Thetis*, Scientific Results of the, 128 †
- New York—
Physical Geography of New York State, by E. T. Turner, 253 †
- Slate Belt of Eastern New York and Vermont, by T. N. Dale, 371 †
- Trade of (Foreign Office Rep.), 253 †
- New Zealand—
Bush of, Canon P. Walsh on the Future of the, 108
- Niamam river, 607
- Niari, Le bassin minier du, par A. Le Chatelier, 580 †
- Nicaragua Canal—
Nicaragua Canal in its Geographical and Geological Relations, by A. Heilprin, 127 †
- Water Supply for the, by A. P. Davis, 585 †
- Nicaragua, Lake—
An Assumed Inconstancy in the Level of, by C. W. Hayes, 254 †
- Nice and District, Trade of (Foreign Office Rep.), 361 †
- Nielsen, Dr. Y., Das neueste Werk über die geographische Onomatologie Norwegens, 362 †
- Nieuwenhuis, Dr. A. W., Tweede reis van Pontianak naar Samarinda, 366 †
- Niger—
Coast Protectorate, Report for 1898-9 (Colonial Rep.), 124 †
- Explorations by M. Bailland on the, 227
- French Niger Territory, M. Bailland on the economic value of, 477

Niger—*continued*.

Territoires français du Niger, par E. Baillaud, 488 †

Nile—

Barrage of the, by Alderman I. Bowes, 488 †

Dam and reservoirs of the, 103

Major Gibbons' Expedition on the, 104

Southern Nile Watershed, 559

White, Removal of "Sudd" from, 103

Ningpo, Trade of (Foreign Office Rep.), 122 †

Nirehuan river, Patagonia, 201

Nkole, A Missionary Journey through, by Bishop Tucker, 249 †

Nordenskiöld, A. E., Randteckningar i gamla handskrifter af Datis La Sfera, 132 †

Nordenskiöld, Otto, Sydpolarforskningens nuvarande ställing och mål, 128 †; Topographisch-geologische Studien in Fjordgebieten, 588 †

Nordgaard, O., The Norwegian North-Atlantic Expedition, 258 †

Norman, Mémie Muriel, In the Haunted Crimea, 363 †

Normandy—

Highways and Byways in, by Percy Dearmer, 120 †

Northcott, Lieut.-Colonel H. P., Report on the Northern Territories of the Gold Coast, 368 †; note on, 683

Norway—

Braesjørste i fordums tid af dr. H. Reusch, 572 †

Et brev til pave Nicolaus den 5te om Norges beliggenhed og undre af Prof. G. Storm, 572 †

Geographische Onomatologie Norwegens, von Dr. Y. Nielsen, 362 †

Klima-Tabeller for Norge, af H. Mohn, 362 †

Paris Exhibition, Official Publication for the, 572 †

Stykke af det Timanske bjergk-jædesystem i Norge af dr. H. Reusch, 572 †

Sundal Drainage System in Central Norway, by R. L. Barrett, 572 †

Trade of (Foreign Office Rep.), 572 †

Valley of Enchantment, by H. Maxwell, 572 †

Vore største indsjøer af, A. Holmsen, 572 †

Norway and Spitsbergen—

Sulle coste di Norvegia e delle Spitzberghe, 573 †

Norwegian North-Atlantic Expedition, by O. Nordgaard, 258 †

Novarese, N., Le Alpi Piemontesi, 485 †

Nova Scotia—

Sydney Coal Field in, Descriptive Note, etc., by Hugh Fletcher, 252 †

Tidal Undulations, Secondary, in the region of, by W. Bell Dawson, 125 †

Novaya Zemlya—

Expedition by Lieut. Borissoff to, 689

Nuer tribe, Central Africa, 182, 303

Nuevo, Valle, Patagonia, 189, 190

Nyasa, Lake—

Untersuchungen im Nyassa-See und in den Seen im nördlichen Nyassa-Land, von Dr. F. Fülleborn, 579 †; note on, 561

Work in region of, 476

Nyasaland, Northern, Dr. Dantz' geological work in, 106

Nyavarongo river, Central Africa, 560

Nyiro river, Central Africa, 79

O.

OBERMAIR, Herr, Einiges über Kartenlesen, 256 †

Obrucheff, V. A., Central Asia, Northern China and the Nan Shan, 121 †

Oceanic Life—

Résultats des Campagnes Scientifiques accomplies sur son Yacht par le Prince de Monaco, 588 †

Oceanography—

Cable Route between Bermuda and Jamaica, On the Survey of the, by R. E. Peake, 704 †

Campagnes Scientifiques de Prince de Monaco, par Dr. J. Richard, 589 †

Chimie Océanique. Les études nouvelles, par J. Thoulet, 589 †

Circulation of the Surface Waters of the North Atlantic, by H. N. Dickson, 589 †

Danish Ingolf-Expedition, 374 †

Eisschmelzung auf die Oceanische Circulation, Ueber den Einfluss der, von O. Pettersson, 130 †

Erklärung und Berechnung des Stromverlaufs an Flussmündungen, von W. Ekman, 258 †

Fluctuations du niveau des mers, par J. Girard, 589 †

Fonds marins recueillis dans l'Iroise, Analyse de, par M. J. Thoulet, 258 †

Gulf Stream Water. On the Origin of, by P. T. Cleve, 130 †

Hydrographischen Untersuchungen des Nordatlantischen Ozeans, by Dr. O. Pettersson, 258 †

Hydrographischer Lehrsat, von M. Knudsen, 589 †

Intorno ad alcuni nuovi areometri ad immersione totale, di G. Guglielmo, 258 †

Italia e il suo Mare, del C. Bertacchi, 704 †

Kritische Bemerkungen zu Dr. Natterer's "Chemisch-Geologischen Tiefseeforschungen," von Prof. T. Fuchs, 589 †

Küstenwasser. Das kalte, von E. White, 130 †

Marine Research, International Conference for, 257 †

Muséum océanographique de Monaco, par Jules Richard, 131 †

Oceanography—continued.

- Några iakttagelser öfver hafsvattnets salthalt i Finska Skärgårdshafvet, af P. H. Olsson, 258 †
- Norwegian Marine Investigations, Report on, by Dr. J. Hjort, O. Nordgaard, and H. H. Gran, 131 †
- Norwegian North Atlantic Expedition, by O. Nordgaard, 258 †
- Océan Arctique, Matériaux océanographiques rassemblés pendant les années 1899-93, par M. N. Andréef, 704 †
- Océanographic Problems, On Some, by Vice-Admiral S. Makaroff, 589 †
- Planktonmètre pour pêches pélagiques à grande vitesse, par G. Buchet, 374 †
- Plankton-organisms, On the Seasonable Distribution of some, by P. T. Cleve, 130 †
- Presidential Address to Section E, Brit. Assoc., by Sir John Murray, 374 †
- Siboga Expedition, On the Work of the, 180 †, 549 *
- Surface Waters of the Sea round the British Coasts, Mean Temperature of the, by H. N. Dickson, 130 †
- Tidal Currents of the North Sea, by A. Buchan, 704 †
- Valdivia Expedition, Oceanographical . . . Work of the, by Dr. G. Schott, 258 †
- Valdivia, Deutsche Tiefsee-Expedition auf dem, von Dr. G. Schott, 589 †
- Wasserzirkulation im Nordatlantischen Ozean, von Dr. O. Pettersson, 257 †
- Ochrid, Lake, Macedonia, 217, 218
- Odessa and District, Agriculture and Trade of (Foreign Office Rep.), 245 †
- Oestreich, Dr. K., on the Geography of the Kosovo Vilayet, 222
- Offord, J., Note on the Geography of Phœnician Inscriptions, 376 †
- Ohio—
- Rock Waters of, by E. Orton, 371 †
- Oikapu, New Guinea, 271
- Okavango—
- Bericht über eine reise nach dem Okavangogebiet, von Lieut. Eggers, 580 †; note on, 561
- Okhotsk and Kamchatka, M. Bogdanovich's Expedition to, 222
- Oldham, R. D., Report on the Great Earthquake of June, 1897.. 696 †; on the coast-line of Thirlmere, 446
- Olsson, P. H., En Trapa-förande torfmosse på Åland, 245 †; Några iakttagelser öfver hafsvattnets salthalt i Finska Skärgårdshafvet, 258 †
- Olsuffjev, E., The Territory of Anadyr, 578 †
- Olufsen, Lieut. O., Danish Expedition to the Pamirs under, 99; Den anden danske Pamir-Expedition, 366 †; Die zweite Dänische Pamir-Expedition, 123 †
- Omin, East Central Africa, 620
- Omond, R. T., Temperature Observations in Somaliland and Abyssinia, 581 †
- Ookhtomsky, Prince E., Travels in the East of Nicholas II., 575 †
- Oppenheim, Dr. Max von, Vom Mittelmeer zum Persischen Golf, 367 †
- Orange Free State—
- Maps: War Map of the, by W. and A. K. Johnston, 136 †
- Ordnance Survey Maps of England and Wales, 134 †, 261 †, 377 †, 496 †, 592 †, 708 †
- Oregon—
- Coos Bay Coal Field, by J. S. Diller, 371 †
- Orkneys—
- Old Red Sandstone of the, by J. S. Flett, 695 †
- Orleans, Prince Henri d', Le Transvaal et l'Abyssinie, 582 †
- Orton, E., The Rock Waters of Ohio, 371 †
- Osborn, Prof. H. F., The Geological and Faunal Relations of Europe and America during the Tertiary Period, etc., 130 †
- Osorno volcano, Patagonia, 33
- Ostiak tribe of Siberia, 347
- Ostrovo, Lake, Macedonia, 218
- Oswald, Dr. A., Eine Besteigung des Ararat, 698 †
- Oswell, William Cotton, Hunter and Explorer, by W. E. Oswell, 705 †
- Oxford—
- Diploma in Geography at, 112
- School of Geography, 3, 357; Scholarship of, 567

P.

- PACAYA volcano, Central America, 478
- Pacific—
- Albatross, Explorations of the, by A. Agassiz, 128 †, 255 †
- Pacific Islands, French—
- Cable across the, Further Correspondence relating to the Proposed construction of a, 255 †
- Notice sur les Etablissements Français de l'Océanie, 703 †
- Padrões or pillars of stone used by the Portuguese discoverers, 627, 642
- Page, J., Ice and Ice Movements in Bering Sea, 373 †; note on, 110
- Pakhoi, Trade of (Foreign Office Rep.), 486 †
- Palena river, Patagonia, 26, 195
- Palestine—
- Days in Galilee and Scenes in Judæa, by Rev. A. A. Boddy, 698 †
- Maps: Murray's Handy Classical Maps, edited by G. B. Grundy, 498 †
- Matthew Paris' map of, 325
- Trade of (Foreign Office Rep.), 248 †
- Pamabo range, Borneo, 39
- Pamirs—
- Dänische Pamir-Expedition, Die zweite, von O. Olufsen, 123 †; note on, 99
- Den anden danske Pamir-expedition, O. Olufsen, 366 †

- Pampaloni, L., I terrini carboniferi di Seni ed oolitici della Perdaliana in Sardegna, 362 †
- Pantellaria, von Dr. A. Mayr, 244 †
- Papal Demarcation—
Lines of Demarcation of Pope Alexander VI., by S. E. Dawson, 494 †
- Papuans of New Guinea, 270
- Para, Trade of (Foreign Office Rep.), 254 †
- Paraguay—
Etymologie des Wortes "Paraguay," von Dr. R. Endlich, 254 †
Trade of (Foreign Office Rep.), 372 †
- Paris—
Paris and Environs with Routes from London to Paris, Handbook for Travellers by K. Baedeker, 361 †
Plans of, and the Exhibition, by W. and A. K. Johnston, 135 †
Plan de l'Exposition Universelle de 1900, par E. Fasquelle, 262 †
Sol et la croissance de Paris, par M. Paul Dupuy, 484 †
- Paris, Matthew, ancient maps of, 319-326
- Parker, E. H., Inscriptions de l'Orkhon, 247 †; Russia's Sphere of Influence; or, a Thousand Years of Manchuria, 122 †
- Parliamentary Reports, etc., Catalogue of, 706 †
- Pasanisi, F. M., La popolazione dell'Europa, 242 †
- Passarge, Dr. S., Durch die Karroo nach Kimberley, 251 †
- Patagonia—
Cordillera of, and its Main Rivers, by Dr. Hans Steffen, 14 *, 185 *
Reisen in den Patagonischen Anden, by Dr. Hans Steffen, 372 †
Southern: Some Geographic Features of, by J. B. Hatcher, 254 †; Sedimentary Rocks of, by J. B. Hatcher, 254 †
Voyage en Patagonie, par le Comte Henri de La Vaulx, 372 †
- Paulitschke, Dr. P., Zur Erinnerung an, von Dr. W. Hein, 590 †; (Biography of), 259 †
- Pavie Mission in Indo-China, Results of the, 248 †, 473
- Payer, Lieut., Map of Franz Josef Land, Admiral von Brosch on, 109
- Payeur - Didelot, M., Trente Mois au Continent Mystérieux, 488 †
- Peake, R. E., On the Survey of the . . . Cable Route between Bermuda and Jamaica, 704 †
- Pearce, Captain F. B., Notes on the Country between Lake Chiuta and the River Luli, 367 †; Rambles in Lion Land, 370 †
- Peary, Mr., Work of, Mr. H. L. Bridgman on, 492 †
- Peary Expedition of 1900 in the Arctic Regions, 109
- Pe-chi-li—
Golf von Petschili, 576 †
- Pe-chi-li—continued.
Report on the Province of Chi-li, Quarter-Master-General's Department, Simla, 486 †
- Peel, C. V. A., On a Collection of Insects . . . made in Somaliland, 370 †
- Peh-shui-chiang, 532
- Pelet, Paul, Atlas des Colonies Françaises, 137 †, 379 †, 709; Un nouvel "Atlas des colonies françaises," 376
- Penas, Gulf of, Patagonia, 204
- Penck, Dr. A., Bemerkungen über alte und neue Lothungen im Hallstätter See, 483; Die Begründung der Lehrkanzel für Geographie und des geographischen Institutes an der Universität Wien, 706 †; Der Vernagtferner, 694 †; Die vierte Eiszeit im Bereiche der Alpen, 694 †; Eduard Brückner, Die feste Erdrinde und ihre Formen, 704 †
- Peragallo, P., Ancora sulla distinta personalità di Verrazzano e Florin, 259 †
- Pereira, J. M. E., Elementos de logographia industrial, 573 †
- Perrine, C. D., Earthquakes in California, 490 †
- Perron, C., Les Reliefs en général et du Relief au 1: 100,000 de la Suisse en particulier, 703 †
- Perrot, Herr B., explorations of Ancient Ruins in German East Africa, 561
- Persia—
Cities of Irân as described in the old Pahalavi treatise of Shatrôih-i-Irân, by J. J. Modi, 578 †
Marco Polo's Itinerary through, Captain Sykes on, 472
Persia, by Sir Lepel Griffin, 248 †
- Persia and Afghanistan—
Problem of the Middle East, by General Sir Thomas Gordon, 123 †
- Persian Gulf—
Ancient Trading Centres of the, by Captain A. W. Stiffe, 211 *
Trade of the (Foreign Office Rep.), 578 †; note on, 682
- Peru—
El Peru en Europa, by C. B. Cisneros and R. E. Garcia, 491 †
Mapa del Peru, by A. Raimondi, 263 †
Sinopsis geográfica y estadística del Peru, 491 †
- Petermann, R. E., Gletscher und Firneere, 257 †
- Peters, Dr. Carl, Macombe's Country, 369 †
- Petersen, Dr. J., Bewegungsrichtungen des diluvialen Inlandeises, 493 †
- Petitot, E., Du Territoire d'Alberta à l'Etat d'Iowa par le Far-West, 371 †
- Petrohue river, Patagonia, 32
- Pettersson, O., Die Wasserzirkulation im Nordatlantischen Ozean, 257 †; Die hydrographischen Untersuchungen des Nordatlantischen Ozeans, 258 †; Ueber die Einfluss der Eisschmelzung auf die Oceanische Cirkulation, 130 †

- Pettersson - Nansen Insulating Water-Bottle, by H. R. Mill, 469
- Pettipice, T. W., The Intermediate School Geography, 706 †; The Irish School Geography, 706 †
- Phenology—
Phänologische Mitteilungen, von E. Ihne, 704 †
- Philadelphia. Trade of (Foreign Office Rep.), 371 †
- Philip, G., London School Board Atlas, 710 †
- Philippines—
Diseases of the Islands, Report of a Special Commission on the, by Prof. Flexner and Prof. Barker, 698 †
Igorroten von Pangasinan, von F. Blumentritt, 578 †
Philippine Islands and their People, by J. G. Schurman, 248 †
Tifones del Archipiélago Filipino y mares circunvecinos, por P. J. Doyle, 248 †
Trade of (Foreign Office Rep.), 578 †
- Phillips, P. L., List of Maps and Views of Washington and District of Columbia, 253 †
- Phœnicia—
Phénicie et les Phéniciens, par E. Reclus, 259 †
- Phœnician Inscriptions, Note on the Geography of, by J. Offord, 376 †
- Photographic Surveying—
Paper on, by J. Bridges Lee, 256 †
Photogrammetrische Terrinaufnahme, von A. von Hübl, 587 †
- Photographs—
Africa, East, by E. J. Mardon, 140 †
British New Guinea, Scenery in vicinity of Kemp Welsh river in, by R. E. Guise, 596 †
Canada, North-West Territories of, by D. T. Hanbury, 139 †
Mongolia and Russian Central Asia, by I. Morse, 380 †
Quetta to Europe, taken by Captain Benn during journey from, 596 †
Sierra Leone, by C. L. Weller, 712 †
Transcaucasia, The Aras and Kur rivers in, by C. S. Gulbentian, 380 †
Vesuvius, Eruption of, by Prof. R. V. Matteucci, 264 †
Yangtse Valley and Sechuen, by R. L. Jack, 500 †
- Phyto-Geography—
Géographie botanique et son évolution au XIX^e siècle, par A. Masclef, 704 †
- Pikes Peak Quadrangle, Granitic Rocks of the, by E. B. Matthews, 583 †
- Pilkington, W., On Methods adopted in carrying out Dock and Harbour Works at Quebec, 125 †
- Pinon, R., La Chine qui s'ouvre, 486 †
- Pio di Savoia, G., Gli Italiani nel sud dello Stato di Sta. Caterina, 372 †
- Pireus, Trade and Agriculture of the (Foreign Office Rep.), 244 †
- Pirie, Mount, Central Africa, 475
- Pittard, Dr. E., Anthropologie de la Suisse, 121 †; Note préliminaire sur l'ethnologie de la Savoie et de Haute-Savoie, 484 †, 570 †
- Pjetursson, H., The Glacial Palagonite Formation of Iceland, 244 †
- Place Names—
Etymologies Lyonnaises, par M. A. Steyer, 706 †
Etymology of Africa and Ophir, by Sir George Birdwood, 134 †
Metodo e misura nelle ricerche di toponomastica, Del Prof. G. Grasso, 592 †
Names of Places, by Sir H. Maxwell, 261 †
River Terminology, by R. Richardson, 376 †
Trascrizione dei Nomi di Luogo, by Dr. S. Crotta, 592 †
- Plague—
Bubonic Plague, History and Geographic Distribution of, by G. N. Sternberg, 131 †
Climatic conditions necessary for the propagation and spread of plague, by B. Latham, 591 †
- Plant-Geography—
Fortschritte der Pflanzen-geographie in 1896 bis 1898, von A. F. W. Schimper, 374 †
Geographische Verbreitung der Rostpilze, von Dr. P. Dietel, 374 †
Latitude, Influence of, on Plant-life in Germany, Prof. Ihne's observations, 680
- Plehn, R., Beiträge zur Völkerkunde des Togo-Gebietes, 582 †
- Pleyte, C. M., Herinneringen uit Oost-Indie, Soematra's Westkust, 123 †, 366 †
- Plumstead, E., Mr. Moxley's Appeal to the Gentiles, 374 †; Dr. Nansen and his Scientific Results, 256 †; Moxley's Theory of the Tides, 705 †
- Poesche, Dr. Theodor (Biography), 259 †
- Poincaré, A., Combinaison des effets des révolutions synodique et tropique de la Lune, 493 †; Rapport sur le projet de revision de l'arc méridien de Quito, 491 †; Mouvements barométriques provoqués . . . par la marche du Soleil et de la Lune, 257 †
- Pokao people, New Guinea, 276
- Poland and Lithuania, Trade of (Foreign Office Rep.), 363 †
- Polar regions—
Conquête des Pôles, La, par Lieut.-Gen. Wauermans, 128 †
Walfang, Die gegenwärtige Eismeer-fischerei und der. von Hegemann, 128 †
- Pomerania, Trade of (Foreign Office Rep.), 243 †
- Pondicherry, Trade of (Foreign Office Rep.), 487 †
- Poole, R. L., Historical Atlas of Modern Europe, 377 †, 708 †

- Poole, W., Rapid Preliminary Surveys on the Darling River, N.S.W., 255 †
- Porena, Prof. F., Della Morfologia della superficie terrestre nella Geografia, 493 †; Le scoperte geografiche del secolo XIX., 375 †, 579 †
- Port au Prince, Haiti, 308
- Porto Alegre, Trade of (Foreign Office Rep.), 490 †
- Porto Rico, its Topography and Aspects, by H. M. Wilson, 491 †; Trade of (Foreign Office Rep.), 702 †
- Port Said and Suez, Trade of (Foreign Office Rep.), 699 †
- Portugal—
Arms of, in use up to 1485.. 628
Elementos de logographia industrial, por J. M. E. Pereira, 573 †
Map: Carta Geologica de, por Delgado e Choffat, 136 †
Trade of (Foreign Office Rep.), 245 †
- Position observations—
Auflösung des Zweiböhen-Problems nach einer Näherungsmethode von Raper, von Dr. C. Börgen, 256 †
Zur Höhenberechnung, von Dr. O. Fulst, 587 †
- Poskin, Dr. A., Bilans Congolais, 249 †; Note sur l'étiologie, le diagnostic . . . de la Malaria, 591 †
- Possession Island, Antarctic, 396 †
- Potanin, G. N., Letzte Reise in West-China, von Dr. E. Bretschneider, 122 †
- Pottinger, Captain E. C., A Recent Survey in Western China, 575 †; Surveys for the Burma-Sechuan Railway, 680, 681
- Prespa, Lake, Macedonia, 217, 218
- Preston, E. D., Geodatische Arbeiten in den Vereinigten Staaten, 125 †; The United States Coast and Geodetic Survey, 126 †
- Prichard, H., Through Haiti, 306 *
- Prins, P., Explorations in the Shari Basin, 228; Vers le Tchad, 250 †; Voyage au Dar Rounga, 250 †
- Proskowetz, Max von, mit einem Epilog (Biography), 133 †
- Prussia—
Pässe der Sudeten unter besonderer Berücksichtigung der Zentralsudeten, von Dr. R. Fox, 243 †
Polaben im hannöverschen Wendland, von Dr. F. Tetzner, 243 †
Provinz Westpreussen und ihre Naturdenkmäler, von Dr. C. Brick, 485 †
Regenkarte der Provinz Ostpreussen, von Prof. Dr. G. Hellmann, 120 †
Römercastell bei Haltern an der Lippe, von Dr. C. Schuchhardt, 243 †
- Puelo river and Cordillera, 36, 185
- Pugh's Almanac and Queensland Directory, 255 †
- Pullar, F. P., and Sir J. Murray, A Bathymetrical Survey of the Freshwater Lochs of Scotland, 121 †, 246 †
- Pungwe River, E. Africa, 165

Punjab—

- Gazetteers of the Peshawur, Kangra, and Montgomery Districts, 577 †
- Railway Flood-Works in the, by R. C. Farrell, 577 †
- Report on the Administration of the, 123 †
- Purey-Cust, Commander H. E., Report on the Undercurrents in the River Congo, 258 †; note on, 349
- Purtscheller, Ludwig (Biography), 590 †
- Purvis, J. B., Handbook to British East Africa and Uganda, 487 †
- Putzger, F. W., Historischer Schul-Atlas, 263 †
- Pyrenees—
High Pyrenees, The, by H. Spender, 362 †
Inondations de 1897 et les effets du déboulement des Pyrénées, par M. S. Guénot, 362 †

Q.

QUEBEC—

- Dock and Harbour Works at, by W. Pilkington, 125 †

Queensland—

- Did De Quiros land in Queensland? by T. F. Bevan, 479, 494 †
- Geological Features of the Country between Warren and Mount Lion, Report on, by B. Dunstan, 586 †
- Pugh's Almanac and Directory, 255 †
- Reply to "Some Critical Notes on the Queensland Volume of the International Catalogue of Scientific Literature," by J. Shirley, 375 †
- Royal Geographical Society of Australasia, Queensland Branch of the, Medal of the, 568
- Quevedo, S. A. Lafone, El "Sebastián Gaboto" de Henry Harrisse, 131 †; Los Ojos de Imaymana y el Señor de la Ventana, 127 †; Progresos de la Etnología en el Río de la Plata, 126 †; El Barco y Santiago del Estero, 126 †
- Quiros and the Discovery of Australia, Cardinal Morau and W. T. Bevan on, 479, 494 †

Quito—

- Mesure de l'arc du méridien de, 585 †
- Rapport sur le projet de revision de l'arc méridien de Quito, par M. Poincaré, 491 †; note on, 356
- Reconnaissance de l'arc du méridien de Quito, par E. Maurain, 491 †; note on, 356

R.

- RACOVITZA, E. G., La vie des animaux et des plantes dans l'Antarctique, 492 †
- Radde, Dr. Gustav, Grundzüge der Pflanzenverbreitung in den Kaukasusländern, 123 †; Die Sammlungen des Kaukasischen Museums, 366 †

- Raffles, Sir Stamford, by H. E. Egerton, 590 †
- Railway Surveying with the Tacheometer, by H. G. Dempster, 256 †
- Raimondi, A., Mapa del Peru, 263 †
- Rainfall—
 Diurnal Range of Rain at Observatories in connection with the Meteorological Office, by R. H. Scott, 121 †
 Drought-Intensity, Observations on the Determinations of, by G. H. Knibbs, 588 †
 Recherches sur les centres d'action de l'atmosphère, II. La Pluie, par H. H. Hildebrandsson, 257 †; note on, 234
 Suggestions for depicting the Character of Seasons as regards Rainfall, by H. Deane, 588 †
- Rajna, Dr. M., Appendice a una discussione su l'unificazione del calendario, 257 †
- Rakas-Tal und Manasarowar, von H. Singer, 576 †
- Ranke, J., Erinnerung an die vorgeschichtlichen Bewohner der Ostalpen, 242 †
- Ravenau, L., Neuvième Bibliographie Géographique Annuelle, 591 †
- Ravenstein, E. G., researches on the distribution of relative humidity, 446; Martin de Bohemia (Martin Behaim), 590 †; The Voyages of Diogo Cao and Bartholomeu Dias, 1482-88.. 625 *
- Ray, Mr., remarks on "Studies in the Anthropogeography of British New Guinea," 440
- Reclus, E., La Phénicie et les Phéniciens, 124 †, 259 †
- Red Sea—
 Origine et la formation de la mer Rouge, par A. Issel, 589 †
- Reed, J. Howard, The Transvaal from without, 252 †
- Rein, Prof. J., Erläuterungen zur Geschichte der Eroberung und Besiedelung der La Plata-Länder, 253 †
- Reina, Prof. V., Determinazione astronomica di latitudine, 256 †
- Reinecke, Dr., Die wirtschaftliche Bedeutung Samoas und die deutschen Pflanzungen, 255 †
- Reliefs—
 Reliefs Perron, Les, par A. de Claparède, 703 †
- Reñihue-Expedition, Die chilenische, von Dr. P. Krüger, 372 †, 585 †
- Reñihue, Río, Patagonia, 192
- Réunion—
 Notice sur la, par A. G. Garsault, 700 †
- Reusch, Dr. Hans, Et stykke af det Timanske bjerk-jaedesystem i Norge, 572 †; Bræsjøer i fordums, 572 †; Geografi for Middelskolen, 133 †; A Note on the last stage of the Ice Age in Central Scandinavia, 694 †
- Rhamm, Karl, Zur Entwicklung des slavischen Speichers, 119 †, 573 †
- Rhine from Rotterdam to Constance, Handbook for Travellers by K. Baedeker, 365 †
- Rhodesia—
 British South Africa Company, Information as to mining in Rhodesia, 700 †
 Reports on the Administration of, 487 †
- Richard, Dr. J., Les Campagnes Scientifiques du Prince de Monaco, 589 †; Le Muséum océanographique de Monaco, 131 †
- Richards, H., Account of the Bay of Balik Papan, 474
- Richardson, R., River Terminology, 376 †
- Richter, Hauptmann, Einige weitere ethnographische Notizen über den Bezirk Bukoba, 250 †; Notizen über Lebensweise . . . des Bezirks Bukoba, 368 †
- Richter, Dr. E., Die Gletscherkonferenz im 1899.. 257 †; note on, 233; Gebirgshebung und Thalbildung, 373 †
- Richtofen, Baron F. v., Karte des nordöstlichen China, 708 †
- Rickmers, W. R., Bokhara, 366 †
- Rickmers, Mrs., A Journey through the Khanate of Bokhara, 248 †
- Rigo District, New Guinea, 284
- Rijnhart, Mr., murder of, in Tibet, 556
- Rio de Janeiro, Trade of (Foreign Office Rep.), 584 †
- Rio Grande do Sul, Vegetationen i, af C. A. M. Lindman, 127 †
- River-basins of North Germany, Geography of, 552
- River-erosion—
 Rate of Erosion of some River Valleys, by C. C. Brittlebank, 589 †
- River-regulation—
 Wildbäche und ihre Verbauung, von G. Strele, 374 †
- River System of North Wales, Mr. Philip Lake on the, 679
- River Terminology, by R. Richardson, 376 †
- Rivers—
 Gewässerkunde im letzten Jahrzehnt, von Willi Ule, 131 †
- Roads—
 Voies de communication, De l'emploi de la main-d'œuvre militaire à la construction des, par Colonel Lyantey, 591 †
- Robertson, Sir George, Political Geography and the Empire, 447 *
- Rockhill, W. W., The Journey of William of Rubruck to the Eastern Parts of the World, translated, etc., by, 485 †
- Rocky Mountain Region, The Freshwater Tertiary Formations of the, by W. M. Davis, 371 †
- Roe, Sir Ch., The Constitutional Relations of England and her Dependencies, 375 †
- Rollet de l'Isle, M., Note au sujet de la détermination de la hauteur du niveau de la mer, 589 †

- Rooper, T. G., on Progress of Geographical Instruction in Elementary Schools, 442
- Roro people, New Guinea, 274, 275
- Rosario, Trade of (Foreign Office Rep.), 126 †
- Rosberg, J. E., Sääksmäki Soeken, 120 †
- Rosh-kala, fortress, Shugnan, 678
- Rosier, W., Le milieu géographique suisse considéré comme facteur du développement historique, 573 †, 695 †
- Rossi, E., L'emigrazione Italiana agli Stati Uniti, 252 †
- Roth, Dr. E., Die deutschen Dünen und ihr Bau, 484 †
- Roussel, E., Une ancienne Capitale-Orange, 570 †
- Rouville, P. G. de, Une station géologique, etc., Les Fumades (près Alais), 120 †
- Roux, M. J. C., Le canal de jonction du Rhone à Marseille, 360 †
- Roxburgh, T. L., and J. C. Ford, The Handbook of Jamaica, 127 †
- Royal Atlas of Modern Geography, by W. and A. K. Johnston, 498 †
- Royal Geographical Society—
Address to the, by Sir C. R. Markham, 1 *
Address on opening Session 1900-1901, by Sir C. R. Markham, 597
Anniversary Meeting, 115; Dinner, 117
Library of, Subjects Catalogue, 3
Meetings of the, Session 1899-1900., 115, 241, 693
- Ruanda, Dr. Kandt's Explorations in, 559
- Ruchuru river, Central Africa, 174
- Rudolf or Gallop, Lake, East Africa, 298 :
Count Leontieff's expedition to, 103, 558
- Rudolf, Lake, and the Nile, An Expedition between, by Dr. Donaldson Smith, 600 *
- Rue, M., Explorations within the Bend of the Congo, 582
- Ruge, W., Ueber Identifizierung antiker Oertlichkeiten, 131 †
- Rukwa depression, Nyasaland, 106
- Rukwa, Lake, Dr. Fülleborn's investigations in, 561
- Rumania—
Documente geografice, de D. N. Jorga, 362 †
Jiu, Sur l'histoire de la vallée du, par M. E. de Martonne, 362 †
Karpates méridionales, Sur la période glaciaire dans les, par M. E. de Martonne, 120 †, 362 †
Population de la Roumanie en 1894, Mouvement de la, 245 †
Societatea Geografică Română, Buletin, 706 †
Sondage et analyse des boues du lac Galcescu, par MM. de Martonne et Murgoci, 120 †
Trade of (Foreign Office Rep.), 694 †
- Runeberg, R., Steamers for Winter Navigation and Ice-breaking, 591 †
- Rusizi river, Tanganyika, 168
- Russell, H. O., Current Papers, No. 4.. 374 †; note on, 689; Results of Rain . . . Observations made in New South Wales, 586 †
- Russell and Macdonald, Messrs., journey in British New Guinea, 107
- Russia—
Chemin de fer en Asie Centrale: Jonction du Transcaspien avec le Transsibérien, par P. Gourdet, 366 †
Coal Crisis in (Foreign Office Rep.), 245 †
Degree-measurement Expedition to Spitsbergen, 111, 567, 688
Description sismique de l'Empire Russe, par F. de Montessus de Ballore, 694 †
En nouvelle Russie, par le Baron de Baye, 363 †
Geologie und Bodenverhältnisse im Kreise Borowitschi, von Prof. P. Zemjatschensky, 573 †
Growth of, by E. A. Grosvenor, 363 †
Militär-Kartographie, Entwicklung der russischen, von S. Truck, 573 †
Population de l'Empire de Russie, Premier Recensement Général de la, 245 †
Russian Railways (Foreign Office Rep.), 120 †
- Ruvuvu river, Central Africa, 559, 560
- Ruwenzori, Mount, letter from Mr. Grogan on his Picture of, 693
- S.
- SABINE Island, East Greenland, 664
- Sachau, E., Am Euphrat und Tigris, 578 †
- Sacred Books of the East, edited by F. Max Müller, 591 †
- Sahara—
Am Nordrande der Sahara, von Dr. W. Behrens, 251 †
Mission Foureau-Lamy, par G. Vasco, 700 †
- St. Antonio, or Ilha do Principe, 625, 626
- St. Elias—
Ascent of Mount St. Elias by the Duke of the Abruzzi, by F. de Filippi, 252 †
St. Lawrence, Gulf of, Currents in the, 685
- Sainte-Marie, L. de, La colonization en Nouvelle-Calédonie, 373 †
- St. Mary, Cape, Padrão at, 628
- Saint-Pierre et Miquelon, par M. Caperon, 701 †
- Saint-Yves, G., Dans le Tian Chan Russe, 123 †; Notes sur la distribution des plantes en Sibérie et dans l'Asie centrale, 698 †
- Sakwala hill, Abyssinia, 295
- Salonica and District, Trade of (Foreign Office Rep.), 695 †
- Salvetat et ses environs, par M. G. Gros, 119 †

- Salwey, Charlotte M., Korea, the Pearl of the Orient, 366 †
- Samoa—
 Die Wirtschaftliche Bedeutung Samoas und deutschen Pflanzungen, von Dr. Reinecke, 255 †
 Hebungen und Senkungen in, von Dr. A. Krämer, 255 †
 Namen der Samoa-Inseln, von W. von Bülow, 491 †
 Samoaner in der heidnischen Zeit, von Dr. G. Kurze, 255 †
 Trade of (Foreign Office Rep.), 255 †; note on, 231
- Samshui, Trade of (Foreign Office Rep.), 576 †
- Sandal Dawan, Central Asia, 519
- Sand-dunes—
 Entstehung der Dünen, von O. Baschin, 704 †
 Formation des Dunes de Sable, par Vaughan Cornish, 258 †
- Sanders, C., Determination of the latitude of Ambriz and San Salvador, 699 †
- San Francisco, California, The Climate of, by A. G. McAdie and G. H. Willson, 126 †
- San Miguel volcano, Central America, 478
- Sapper, Dr. Carl, Bemerkungen über einige Vulkane von Guatemala und Salvador, 585 †; Vulkan-Skizzen aus Guatemala und Salvador, 498 †; note on, 478
- Sarawak, trade of, 54
- Sardinia—
 I terreni carboniferi di Seui ed oolitici della Perdaliana in Sardegna, di L. Pampaloni, 362 †
 Trade of (Foreign Office Rep.), 572 †
- Sargon pass, Central Asia, 511
- Sarikol range, 529
- Sartorius, A., Die Germanisierung der Rätomanen in der Schweiz, 246 †
- Sassoon, Sir E. A., Imperial Telegraphic Communication, 258 †
- Satow, Sir E., The Cultivation of Bamboos in Japan, 578 †
- Savinien, R. P., Voyages et aventures d'un Missionnaire dans le Far-West, 253 †
- Savoy—
 Ethnologie de la Savoie et de Haute-Savoie, par Dr. E. Pittard, 570 †
- Saxe-Coburg and Gotha, H.R.H. the Duke of, obituary of, 358
- Saxony—
 Kalender und Statistisches Jahrbuch für das Königreich Sachsen, 571 †
- Scandinavia—
 Einfluss der Eiszeit auf das Natur- und Kulturbild der skandinavischen Länder, von H. Kerp, 120 †
 Er der foregået nye invandringer i Norden? af C. O. E. Arbo, 120 †
 Ice Age in Central Scandinavia, A note on the last stage of the, by H. Reusch, 694 †
- Scandinavia—continued.
 Till kändedom om Skandinaviens geografi och Kartografi, af K. Ahlén, 694 †
- Scenery, The Study of, by John E. Marr, review, 112
- Schaffer, Dr., Expedition to Asia Minor, 556
- Scheibler, F., Sette Anni di Caccia Grossa e Note di Viaggio in America, Asia, etc., 133 †
- Schenk, Dr. A., Ethnogenie des populations helvétiques, 121 †
- Schimper, A. F. W., Bericht über die Fortschritte der Pflanzen-geographie, 374 †
- Schleswig-Holstein—
 Geographischen Verteilung der Personennamen Schleswig-Holsteins um 1500, von R. Hansen, 485 †
- Schlüter, Dr. O., Ueber den Grundriss der Städte, 132 †; note on, 235; Die Formen der ländlichen Siedelungen, 259 †
- Schmidt, Emil, Die Verteilung der Kopfformen in Europa, 119 †
- Schmitt, R. H., Geographische Ortsbestimmungen in Ostafrika, 368 †
- Schnee, Dr., über eine Fahrt nach der Südküste Neu-Pommerns, 127 †; voyage along the South Coast of New Britain, 107
- Schoch, G., Una crociera nel Mar Polare Artico, 128 †
- Shokalsky, J. de: see Shokalsky
- Schott, Dr. G., Die deutsche Tiefsee-Expedition auf dem Dampfer *Valdivia*, 491 †, 589 †; Die Strömungen zwischen Singapore und Taku, 576 †; The Oceanographical . . . Work of the *Valdivia* Expedition, 258 †; Sprungwelle und Fluthgrösse im oberen Theil der Fundy-Bai, 125 †
- Schuchhardt, Dr. C., Das Römercastell bei Haltern an der Lippe, 243 †
- Schumann, O., Islands Siedlungsgebiete während der landnámatið, 361 †
- Schurman, J. G., The Philippine Islands and their People, 248 †
- Schurtz, H., Kairuan, 252 †
- Schwaighofer, Dr. W., on Austria-Hungary and the Eastern Trade, 553
- Schweinfurth, Dr. E. Manfredo Camperio (Biography), 590 †
- Schweinfurth, G., Aufnahmen in der Östlichen Wüste von Ägypten, 708 †
- Schwerin, H. H. von, Om Kustfolks olika sjöduglighet, 375 †
- Seidmore, Eliza R., China, the Long Lived Empire, 486 †
- Scotland—
 Bathymetrical Survey of the Freshwater Lochs of, by Sir J. Murray and F. P. Pullar, 121 †, 246 †
 Botanical Survey of, by Robert Smith, 574 †
 Rainfall, Annual, from 1800 to 1898, by Dr. A. Buchan, 364 †

Scotland—*continued*.

- Thorough Guide Series, by M. J. B. Baddeley, Scotland, Part i., 364 †;
ditto, Orkney and Shetlands, 364 †
Scott, R. H., The Diurnal Range of Rain at Observatories in connection with the Meteorological Office, 121 †
Seals of the antarctic, 382

Sea-water—

- Physical and chemical constants of, Dr. Knudsen on, 445

Sechuan, Railway to, Captain E. C. Pottinger's surveys for the, 681

Sechuen, South-West, A Journey through, by E. Amundsen, 531 *

Seismology—

- Propagation of Earthquake Vibrations through the Earth, by Prof. C. G. Knott, 704 †

Seismological Investigation, Fourth Report of the Committee, 374 †

Sismoscopio elettrico a doppio effetto per le scosse sussultorie, di G. Agamennone, 258 †

Selangor Government Railway, by G. H. Fox, 578 †

Seler, C., Auf alten Wegen in Mexiko und Guatemala, 701 †

Seligmann, Mr., remarks on "Studies in the Anthropogeography of British New Guinea," 440

Sella mountain, Eastern transverse arch of, 463

Selous, F. C., Sport and Travel East and West, 707 †

Sendip, Shugnan, 677

Serebrennikov, Lieut.-Colonel, On the Afghan Frontier: A Reconnaissance in Shugnan, 666 *

Serrano, Captain, expedition to the Palena, 26

Serbia—

Rumänen in Serbien, von Prof. G. Weigand, 245 †

Siedlungskunde Südserbiens, von Dr. M. V. Smiljanic, 573 †

Trade of (Foreign Office Rep.), 245 †

Settlements—

Formen der ländlichen Siedelungen, von Dr. O. Schlüter, 259 †

Sewell, Robert, A Forgotten Empire (Vijayanagar), 696 †

Seychelles—

Découverte des îles Seychelles d'après des Documents inédits, par M. A. A. Fauvel, 247 †

Shaid, Wadi, 539

Shakh-Dara, territory and people of, 669; river of, 672, 678

Shaler, N. S., J. B. Woodworth, and A. F. Foerste, Geology of the Narragansett Basin, 583 †

Shan States—

Northern: Preliminary Report on the Geology of the, by T. D. La Touche, 577 †

Shan States—*continued*.

Southern: Geological Reconnaissance in Parts of the, by C. S. Middlemiss, 577 †

Shari river—

M. P. Prins' Explorations on the, 228

Sources du Chari, 251 †

Sharman, G., and E. T. Newton, Notes on Fossils collected at Seymour island, by Dr. Donald and Captain Larsen, 586 †

Sharpe, A., Report on the British Central Africa Protectorate, 475

Sharpe, Dr. Bowdler, remarks on "In the Heart of Borneo," 61; remarks on "An Expedition between Lake Rudolf and the Nile," 624

Sherriff, William, Railway Communication with China, 696 †

Shipping and Ship-building on the American Lakes, Mr. T. Erskine's report on, 353, 489 †

Shirley, John, A Reply to "Some Critical Notes on the Queensland Volume of the International Catalogue of Scientific Literature," 375 †

Shokalsky, Colonel J. de, Limnological Investigations on Lake Ladoga, 471; Le général de Tillo, 590 †; Le lac Ladoga au point de vue thermique, 694 †; note on, 471

Shugnan, A Reconnaissance in, from journal of Lieut.-Colonel Serebrennikov, 666 *

Siam—

Surveying and Exploring in Siam, by James McCarthy, 578 †

Siberia—

Bogdanowitsch' Ochotskisch - Kamtschatkasche Bergexpedition, von General Krahmer, 366 †; note on, 222
Ethnographic Researches in, by Dr. J. Jankó, 347

Geologischen Ergebnisse der Reisen von Baron E. Toll, von Dr. C. Diener, 698 †

Geschichtliche Entwicklung Sibiriens, 578 †

High plains of, 95

Maps: Geologische Skizze der Neusibirischen Inseln, etc., von Baron E. Toll, 498 †

Natur des Gebietes Jakutsk, von P. v. Stenin, 248 †

Transbaikalian branch of the Siberian railway, 223

Siberia and Central Asia—

Plantes en Sibirie et dans l'Asie centrale, Notes sur la distribution des, par G. Saint-Yves, 698 †

Siboga Expedition to the Malay Archipelago, 549; On the Work of the, 130 †; The Cruise and Deep-sea Exploration of the, in the Indian Archipelago, 697 †

Sicily—

Conche lacustri dovute a suberosioni nei gessi in Sicilia, di O. Marinelli, 362 †

- Sicily—*continued*.
 Etna, Mont, Sur l'observatoire du, par J. Janssen, 572 †
 Sullo stato presente dei vulcani colici, del M. Baratta, 572 †
 Siedel, H., Photographien aus Deutsch-Ostafrika, 250 †
 Siegmeth, K., Wanderungen im Siebenburgischen Erzgebirge und im Bihar-Kodru-Gebirge, 571 †
 Sierra Leone—
 Photographs of, by C. L. Weller, 712 †
 Sievers, Prof. W., Hermann Wagner (Biography of), 259 †; Die geographische Erforschung Südamerikas im 19 Jahrhundert, 372 †; note on, 478
 Sikait, Wadi, and Jebel, 541, 548
 Sikhim Himalayas, Lepcha Land, or Six Weeks in the, by Florence Donaldson, 697 †
 Silk—
 Production de la soie dans le monde, par M. V. Groffier, 131 †; note on, 357
 Silat river, Borneo, 42
 Silver Map of Drake's Voyage, Mr. Miller Christy on, 113
 Simpson, Major W. A., Influence of Geographical Conditions on Military Operations in South Africa, 370 †
 Sinai—
 Voyage au mont Sinaï, par A. Keller, 578 †
 Singapore und Taku, Die Strömungen zwischen, von Dr. G. Schott, 576 †
 Singer, H., Rakas-Tal und Manasarowar, 576 †
 "Situs Hierusalem," mediæval map, 326
 Skeat, W. W., Expedition in the Malay Peninsula, 345
 Slavery, Sixty Years against, 261 †
 Slavs—
 Entwicklung des slavischen Speichers, von Karl Rhamm, 573 †
 Slichter, C. S., Theoretical Investigation of the Motion of Ground Water, 374 †
 Smiljanic, Dr. M. V., Beiträge zur Siedlungskunde Südserbiens, 573 †
 Smith, C. M., Results of Observations of the Fixed Stars made with the Madras Meridian Circle, 365 †
 Smith, Dr. Donaldson, Expedition in Somaliland, 102; An Expedition between Lake Rudolf and the Nile, 600 *
 Smith, Major-General Sir R. Murdoch, obituary of, 237
 Smith, Robert, Botanical Survey of Scotland, 574 †; (Biography), 705 †
 Smith, V. A., The Buddhist Monastery at Sohnag, 487 †
 Smyrna and District, Trade of (Foreign Office Rep.), 698 †
 Smyth, H. Warington, remarks on receiving Medal on behalf of Mr. J. McCarthy, 116
 Sobat basin, French Explorations in the, 476; Sobat river, 302
 Sobral, J. G., Estudios sobre las Regiones árticas, 128 †
 Society Islands. Trade of the (Foreign Office Rep.), 586 †
 Sokotra, Exploration of, Report of the Committee, 370 †
 Solomon Islands, Austrian Explorations in the, 230
 Somali Coast—
 Trade of (Foreign Office Rep.), 249 †
 Italian, Condition and Prospects of, 104
 Somaliland—
 Expedition, Dr. Donaldson Smith's, 102
 French: Djibouti et Obock, par M. P. Barré, 367 †
 Journey through, by Dr. R. Koettlitz, 700 †
 Rambles in Lion Land, by Captain F. B. Pearce, 370 †
 Roches volcaniques du Protectorat des Somalis, par MM. A. de Gennes et A. Bonard, 488 †
 Seventeen Trips through, by Major H. G. C. Swayne, 700 †
 Somaliland and Abyssinia—
 Journey through, by R. Koettlitz, 581 †
 Temperature Observations in, by R. T. Omond, 581 †
 Sondo river, British East Africa, 85, 88
 Sonora, State of, Trade and Agriculture of the (Foreign Office Rep.), 582 †
 Sotik country and people, Central Africa, 79, 84
 Southampton. Notes on the Walls of, by W. H. St. John Hope, 121 †
 Southern Cross Expedition to the Antarctic, by C. E. Borchgrevink, 381 *
 Spain—
 Cession of Islands to the United States, 683
 Espagne, politique, littérature, etc., 363 †
 Maps: Mapa Militar de la Capitanía General del Norte (Deposito de la Guerra, Madrid), 708 †
 Voyage en Espagne, par L. F. Viala, 121 †
 Spanish explorations in Chile, 15
 Speleology—
 Spéléologie ou Science des Cavernes, par E.-A. Martel, 374 †
 Spender, H., The High Pyrenees, 362 †
 Spiro, J., Les Yezidi ou les adorateurs du Diable, 124 †
 Spitsbergen—
 Degree-measurement operations in, 111, 567, 688
 Expédition suédoise au Spitzbergen, Travaux de, par V. Carlheim-Gyllensköld, 256 †
 Hudson's Voyage to Spitsbergen in 1607, by Sir Martin Conway, 256 †
 Some unpublished Spitsbergen MSS., by Sir Martin Conway, 378 †
 Spitsbergen, 1898 and 1899, Voyages with H.S.H. the Prince of Monaco, by W. S. Bruce, 587 †
 Sprecher, F. W., Grundlawinenstudien, 588 †

- Stahl, A. F., Teheran und Umgegend, 248 †
- Stanford, E., Map of Morocco, Algeria, etc., 378 †
- Stanmore, Lord, remarks on "In the Heart of Borneo," 60
- Starr, F., Catalogue of a Collection of Objects illustrating the Folklore of Mexico, 489 †
- Statesman's Year Book, by J. Scott Keltie and I. P. Renwick, 134 †
- Statistics—
Address to the Economic Science and Statistics Section of the British Association, by Major P. G. Craigie, 705 †
- Steam Navigation, Address on, by Sir W. H. White, 259 †
- Steeb, C. R. von, Die Ausgleichung mehrfach gemessener Höhen bei der Militär-Mappierung, 588 †
- Stefan, A., Fünfzehn Monate im südlichen Eismeer, 586 †
- Stefănescu, Dr. J., Paludismul din punct de vedere geografic, 375 †
- Stefani, Prof. C. de, La produzione dell'acido borico . . . in Italia, 571 †
- Stefanie, Lake, 606
- Steffen, Dr. Hans, The Patagonian Cordillera and its Main Rivers, 14*, 185*; Reisen in den Patagonischen Anden, 372 †
- Stein, Mr., expedition to Ellesmere Land, 689
- Stein, M. A., Memoir on Maps illustrating the Ancient Geography of Kásmír, 487
- Stein, Oberleutnant v., Erläuterungen zu meinen Reisen in Süd-Kamerun, 368 †, 562
- Stein, P. v., Die Natur des Gebietes Jakutsk, 248 †
- Stenroos, K. E., Thierphänologische Beobachtungen in Finland, 363 †
- Sternberg, G. N., The History and Geographic Distribution of Bubonic Plague, 134 †
- Stevens, —, Trade of Batoum and District, 366 †
- Steyert, M. A., Étymologies Lyonnaises, 706 †
- Stierling, J., Die Königsgräber der Wahehe, 488 †
- Stiffe, Captain A. W., Ancient Trading Centres of the Persian Gulf, VI. Bandar Abbas, 211 *
- Stirling, E. C., and A. H. C. Zietz, Fossil Remains of Lake Callabouna, 128 †
- Stock, Franz, Zum neunhundertjährigen Jubiläum der ersten Entdeckung Amerikas, 131 †
- Stockholm, Trade of (Foreign Office Rep.), 246 †
- Stone, G. H., The Glacial Gravels of Maine, 583 †
- Storm, Dr. Gustav, Et brev til pave Nicolaus den 5te om Norges, 572 †
- Strachey, Sir R., on the conformation of the Himalayas, 527; Narrative of a Journey to the Lakes Rakas-tal and Manasarowar, 247 †
- Strandes, Justus, Die Portugiesenzeit von Deutsch- und Englisch-Ostafrika, note on, 353
- Strele, G., Die Wildbäche und ihre Verbauung, 374 †
- Struck, Ad., Durch Pontus nach Amassia, 248 †
- Subis, Mount, Borneo, 40
- Subjects Catalogue of the Library of the R.G.S., 3
- Suchitan volcano, Central America, 478
- Sudan—
Arabischen Beduinendialekte Innerafrikas, Material zum Studium der, von G. Kampffmeyer, 581 †
- Bonchamps, Résultats géographiques de la mission de, par C. Michel, 580 †; note on, 476
- Egyptian, Report on the, 103
- French: Une ville du Niger, Dienné, par M. G. Bastard, 250 †; Le Soudan français, par M. H. Lorin, 250 †; M. Baillaud's Expedition in, 227; Territoires français du Niger, leur valeur économique, par E. Baillaud, 580 †; note on, 477; Vers le Tchad, par P. Prins, 250 †; Voyage au Dar Rounga, par P. Prins, 250 †
- Geographical Progress in the, 599
- Suess, Ed., La Face de la Terre, 130 †
- Suez Canal—
Engineering Works of the, A Short History of the, by Sir C. Hartley, 580 †
- Sufra, Jebel, 539
- Sumatra—
De inlijving der V. Kota-Kampar, door A. L. van Hasselt, 123 †
- Herinneringen uit Oost-Indië, Soematra's Westkust, door C. M. Pleyte, 123 †, 366 †
- Poeloe Weh, door E. Heldring, 697 †
- Tabakkultuur in Sumatra, 248 †
- Supan, Dr., Die Hohengrenze des Baumwuchses in den Vereinigten Staaten, 252 †
- Superior, Lake—
Geological History of, by Dr. R. Bell, 582 †
- Surveying—
Ausgleichung mehrfach gemessener Höhen bei der Militär-Mappierung, von C. R. von Steeb, 588 †
- Methods of Survey employed by the Chilean Boundary Commissions, by Prof. A. Bertrand, 704 †
- Railway Surveying with the Tacheometer, by H. G. Dempster, 256
- Topographic Surveying, etc., by G. Heimbrod, 587 †
- Sutherland, W., A Possible Cause of the Earth's Magnetism, 589 †
- Sutton, J. R., The Winds of Kimberley, 367 †; Do the mining operations affect the climate of Kimberley? 367 †

Swahili—

Sitten und Gebräuche der Suaheli,
von C. Velten, 488 †

Swatow, Trade of (Foreign Office Rep.),
486 †

Swayne, Major H. G. C., Seventeen Trips
through Somaliland, 700 †

Swaziland, by A. M. Miller, 251 †

Sweden—

Climat de la Suède, par M. Egnel,
695 †

Degree - measurement Expedition to
Spitsbergen, 111, 567, 688

Nya bidrag till Vermlands och Dals
bryogeografi, af N. C. Kindberg, 246 †

Physische Geographie von Schweden,
von G. Andersson, 121 †

Studier öfver vattenförhållandena i
svenska sjöar, af G. Nerman, 246 †

Svenska Turistföreningens Årsskrift för
År 1900. . 121 †

Trade of Stockholm and Eastern coast
of (Foreign Office Rep.), 246 †

Ume river-valley, On the Glacial Lakes
in the upper part of the, by Axel
Gavelin, 695 †

Switzerland—

Annuaire Statistique de la Suisse, 573 †

Anthropologie de la Suisse, par E.
Pittard, 121 †

Ethnogenie des populations helvétiques,
par Dr. A. Schenk, 121 †

Geographisches Lexikon der Schweiz,
von C. Knapp und M. Borel, 573 †

Germanisierung der Rätoromanen in
der Schweiz, von A. Sartorius, 246 †

Glacial Erosion in the Valley of the
Ticino, by Prof. W. M. Davis, 121 †

Milieu géographique suisse considéré
comme facteur du développement
historique, par W. Rosier, 573 †, 695 †

Schweizerische Landschaft einst und
jetzt, von Dr. E. Brückner, 573 †

Tourtemagne, La vallée de, par H.
Correvon, 695 †

Zermatt, Valley of, and the Matterhorn,
by Ed. Whymper, 121 †

Sykes, Captain P. M., on Marco Polo's
Itinerary through Persia, 472

Symons, George James, by H. Sowerby
Wallis, 133 †

T.

TAGANROG, Trade of (Foreign Office Rep.),
573 †

Tajiks-Shugnans, 671; Tajik dwellings,
676

Takla Makan desert, 502

Talko-Hryniewicz, J. de, Notes sur l'An-
thropologie des Chinois du Nord, 122 †

Tanganyika, Lake, Mr. Moore's expedition
to, 227

Tasiagaluk, or Eskimo Seal Lake, Labra-
dor, 686

Tebang, Mount, Borneo, 51

Teheran und Umgegend, von A. F. Stahl,
248 †

Telegraphic Communication, Imperial, by
Sir E. A. Sassoon, 258 †

Temperature—

Actions planétaires et la température
terrestre, par A. Duponchel, 588 †

Einfluss des Waldes auf die Lufttem-
peratur, etc., von Prof. Dr. Müttrich,
588 †

Terrestrial Magnetism—

Deutschen Seewarte über die Ergeb-
nisse der magnetischen Beobach-
tungen in dem deutschen Küsten-
gebiete, 705 †

Earth-currents and the electrical cur-
rents in the atmosphere, etc., by S.
Lemström, 375 †

Earth's Magnetism, A Possible Cause
of the, by W. Sutherland, 589 †

Messung der Horizontal-intensität des
Erdmagnetismus Mittels des Magne-
tischen Theodoliten, von J. Liznar,
589 †

Terror, Mount, Antarctic, 399

Tetzner, Dr. F., Die Polaben im hannö-
verschen Wendland, 243 †

Texas—

Map of, by R. T. Hill, 263 †

Reaction Breakwater at Aransas Pass,
Efforts made to demonstrate the
Practicability of the, by L. M. Haupt,
253 †

Trade of (Foreign Office Rep.), 253 †

Thessaly, Trade and Agriculture of
(Foreign Office Rep.), 244 †

Thomasset, Captain, La Côte d'Ivoire,
124 †; note on, 104

Thompson, Prof. D'Aroy, On a supposed
resemblance between the Marine Faunas
of the Arctic and Antarctic Regions,
587 †

Thoroddsen, T., Jordskjælv i Islands
sydlige Lavland, 362 †

Thoulet, M. J., Analyse de fonds marins
recueillis dans l'Iroise, 258 †; Analyse
mécanique des sols sous-marins, 589 †;
Les études nouvelles de Chimie
Océanique, 589 †; Les phénomènes
volcaniques dans leurs rapports avec
l'océanographie, 705 †

Threlfall, T. R., Senussi and his threatened
Holy War, 124 †

Thung or Thungal pass, Central Asia,
508

Thuringia—

Litteraturbericht zur Landes- und
Volkskunde Thüringens, von A. Berg,
243 †

Sormitzgebiet, physisch-geographische
Skizze, von O. Wiefel, 243 †

Thursday Island and Torres Straits, Past
and Present of, by Hon. John Douglas,
128 †

Tian Shan—

Dans le Tian Chan Russe, par G. Saint-
Yves, 123 †

Tibet—

- Captain Deasy's journeys in, 141
 Murder of Mr. Rijnhart in, 556
 Northern: Dr. Sven Hedin's journeys in, 472
 Rakas-tal and Manasarowar, Lakes, Narrative of a Journey to the, by Sir R. Strachey, 247 †
 Rakas-Tal und Manasarowar, von H. Singer, 576 †

Ticino, Valley of the, Glacial Erosion in the, by Prof. W. M. Davis, 121 †

Tides—

- Détermination de la hauteur du niveau de la mer à un instant quelconque du marée, par M. Rollet de l'Isle, 589 †
 Moxly's Appeal to the Gentiles, by E. Plumstead, 374 †
 Moxly's Theory of the Tides, by E. Plumstead, 705 †
 New Theory of, by Rev. J. H. S. Moxly, 705 †
 Ocean Tides, A partial explanation of some of the principal, 589 †

Tidikelt—

- Mission au Tidikelt, archipel Touatien, par G. B. M. Flamand, 224, 369 †
 Mission d'exploration scientifique au Tidikelt, par G. B. M. Flamand, 369 †

Tientsin, Trade of (Foreign Office Rep.), 576 †

Tillo, Lieut.-General Alexis de (Biography), 133 †; ditto, von Prof. Dr. A. Woeikow, 133 †; par J. de Schokalsky, 590 †

Time—

- Time and its Curious Contradictions, by W. Allingham, 256 †
 Unificazione del calendario, Appendice a una discussione su l', del Dr. M. Rajna, 257 †

Times Atlas, 264 †

Tirol—

- Einfluss der Erosion auf die Structur der Südosttirolischen Dolomitstöcke, von Prof. Dr. C. Diener, 119 †
 Steinach am Brenner, von J. Jäger, 483 †

Toaripi people, New Guinea, 273

Tobago—

- Planting in, Hints and Suggestions on, 702 †

Todd, J. E., The Moraines of South-Eastern Dakota, 84 †

Todd, Mabel L., Corona and Coronet, 592 †

Todd, Prof. H. D., and Prof. S. J. Brown, Total Eclipse of the Sun, May, 1900.. 260 †

Todos los Santos, Lake, Patagonia, 33

Togo—

- Erschliessung des Kaburelandes in Nordtogo, von F. Hupfeld, 251 †
 Geographische Ortsbestimmungen von Dr. Kersting im Hinterland von Togo, von Dr. F. Cohn, 368 †

Togo—continued.

- Togo unter Deutsche Flagge, von Heinrich Klose, review, 106
 Völkerkunde des Togo-Gebietes, von R. Plehn, 582 †

Tolan Khoja valley, 503

Toll, Baron, Auxiliary Arctic Expedition of, 567; Geologische Skizze der Neusibirischen Inseln, etc., 498 †; on New Siberia and the Circumpolar Tertiary Flora, by P. Kropotkin, 95

Tonga, British Agreement with, 108

Tope-Tope marsh, Congo, 562

Torres Straits—

- Anthropology and Natural History of, Report of the Committee, 373 †
 Inhabitants of islands of, 414
 Tower, G. W., and G. O. Smith, Geology . . . of the Tintie District, Utah, 372 †

Town Plans—

- Grundriss der Städte, Ueber den, von Dr. O. Schlüter, 132 †; note on, 235

Townley, —, German Colonial Estimates for 1900.. 260 †

Towns—

- Town Sites, from a geographical point of view, by H. R. Mill, 590 †

Transcaucasia—

- Photographs taken in neighbourhood of the Aras and Kur rivers, by C. S. Gulbentian, 380 †

Transvaal—

- Maps: Northern Portion of the, by Wood and Ortlepp, 378 †; Vereeniging-Pretoria portion of the, by E. H. V. Melvill, 378 †

Transvaal from without, by J. Howard Reed, 252 †

Transvaal and Abyssinia—

- Transvaal et l'Abyssinie, conférence de Prince Henri d'Orleans, 582 †

Transvaal and South Africa, Collection of References, etc., by Cotgreave, 125 †

Transvaal and Swaziland—

- Mining and Minerals in the, by E. St. John Lyburn, 700 †

Travelling, The Art of, An interview with Mrs. J. F. Bishop, 592 †

Travels—

- Explorations et travaux géographiques des Missionnaires Catholiques en 1899, par V. Groffier, 707 †

Ferienreisen und Studien, von Bertha von der Lage, 592 †

Sport and Travel East and West, by F. C. Selous, 707 †

With Note-book and Camera, by Edith Baring-Gould, 707 †

Trebizond and Sivas, Trade of the Vilayets of (Foreign Office Rep.), 248 †

Tregear, E., Mangareva Dictionary, Gambier Islands, 255 †

Tricoche, Général, par L. Drapeyron, 590 †

Trinidad—

- Trinidad Reviewer, compiled by F. Eversley, 702 †

- Trombetas, Voyage au, par O. Coudreau, 490 †
- Tronador, Mount, Patagonia, 34
- Tropical Agriculture—
Garton Lectures on Colonial and Indian Agriculture, by R. Wallace, 707 †
- Tropics, Ants as Geologic Agents in the, by J. C. Branner, 126 †
- Truck, S., Die Entwicklung der russischen Militär-Kartographie, 573 †
- Tuat—
Marche vers le Touât, par R. de Caix, 251 †
- Oases, M. Flamand's Scientific Mission to the, 224, 369 †
- Tucker, Bishop, A Missionary Journey through Nkole, 249 †
- Tugwell, Bishop, and Rev. A. E. Richardson, The Expedition to Hausaland, 581 †
- Tunis—
Grundlagen des französischen Protectorates in Tunesien, von V. Levy, 700 †
- Lac de Bou-Grara et la pénétration, par M. E. Vassel, 370 †
- Situation économique de la Tunisie, par M. E. Fallot, 370 †
- Tunnicliffe, Dr. F. W., Dr. William Marcet, 132 †
- Turkana tribe, Central Africa, 300
- Turkestan—
Russian: De l'état actuel du Turkestan Russe, par M. Vénukoff, 248 †
- Turkey—
Die Karte der europäischen Türkei herausgegeben vom kaiserl. Ottomanischen Generalstabe, 573 †
- Handbook for travellers in Constantinople and the Troad, by Sir C. W. Wilson, 574 †
- Maps: European Turkey (Turkish General Staff), 136 †; note on, 221
- Pontus nach Amassia, Durch, von A. Struck, 248 †
- Trebizond and Sivas, Trade of the Vilayets of (Foreign Office Rep.), 248 †
- Turquie d'Asie, Géographie administrative, etc., par Vital Cuinet, 248 †
- Turner, E. T., Physical Geography of New York State, 253 †
- Twombly, A. S., Hawaii and its People, 372 †
- Tyrrell, J. B., The Basin of the Yukon River in Canada, 370 †
- U.
- UBERI people, New Guinea, 281
- Uchi valley, Central Asia, 507
- Uganda Railway, Memoranda relating to, 370 †
- Ule, Willi, Die Gewässerkunde im letzten Jahrzehnt, 131 †
- Um Selim, Northern Ethai, 537
- United Kingdom—
Barometric and Thermometric Gradients between London and Edinburgh, R. O. Mossman, 364 †
- British Rainfall, 1899, compiled H. S. Wallis, 695 †
- Earthquakes, On some Minor, by Davison, 121 †
- Food Supply of the, by R. F. Crawford, 121 †; note on, 220
- Imports and Exports of 40 Years, by G. Mulhall, 364 †
- Literature and History of the British Islands, Catalogue of, 574 †
- Meteorological Observations at Station of the Second Order, 246 †
- Mines and Quarries: General Report and Statistics, 246 †
- Ordnance Survey, Twelve Years' Work of the, by Colonel Sir J. Farquharson, 364 †
- Photographs of Geological Interest in the, Tenth Report of the Committee, 364 †
- Rain, Diurnal Range of, at Observatories in connection with the Meteorological Office, by R. H. Scott, 121 †
- Southport, The Fernley Observatory Report, etc., by J. Baxendell, 246 †
- Statistical Tables relating to the Colonial and other Possessions of the, 133 †
- Tide Tables for the British and Irish Ports, by Captain Harris and Commander Havergal, 695 †
- United States—
Agriculture, Commerce, and Navigation, Work of the Meteorologist to the Benefit of, by F. H. Bigelow, 584 †
- Altitudes in the, Dictionary of, by H. Gannett, 490 †
- Baumwuchses in den Vereinigten Staaten, Hohengrenze des, von Prof. Dr. Supan, 252 †
- Coast and Geodetic Survey, its origin etc., by E. D. Preston, 126 †
- Coastal Topography of the, by Prof. G. C. S. Carter, 126 †
- Emigrazione Italiana agli Stati Uniti, del E. Rossi, 252 †
- Geodätische Arbeiten in den Vereinigten Staaten, von E. D. Preston, 125 †
- Hydrographic Charts, 139 †, 264 †, 500 †, 595 †, 712 †
- Irrigation, Rise and Future of, by E. Mead, 490 †
- Maps: Geologic Atlas of the (U.S. Geo. Survey), 595 †
- Missions Catholiques aux États-Unis, 125 †
- Naval Observatory, Report of the Superintendent of the, 253 †
- Nordamerikanische Union als Weltmacht, von Dr. E. Deckert, 701 †
- North American Indians of To-day, by G. B. Grinnell, 701 †

United States—*continued*.

- Pueblofolksens Konstlif, Skildringar ur, af Y. Hirn, 253 †
 Rock Specimens, Educational Series of, etc., by J. S. Diller, 490 †
 Spanish Islands, cession of, to the, 683
 Sternenbanner-Republik, In der, von Dr. C. Gardini, 701 †
 Stream measurements for 1897, Report of, by F. H. Newell and Others, 372 †
 Temperature, Humidity, and Wind Direction, Vertical Gradients of, by H. C. Frankenfield, 583 †
 Voyages . . . d'un Missionnaire dans le Far-West, par R. P. Savinien, 253 †
 Weather Bureau, Monthly Weather Review, Annual Summary, 253 †
 Urmi, Salt Lake of, On the Waters of the, by R. T. Günther and J. J. Manley, 123 †
 Urundi district, Central Africa, 559
 Utah—
 Geology . . . of the Tintic District, by G. W. Tower and G. O. Smith, 372 †

V.

- Valdivia*, Die deutsche Tiefsee-Expedition auf dem, von Dr. G. Schott, 589 †;
 Oceanographical . . . Work of the, by Dr. G. Schott, 258 †
 Vallejo, F. R., Departamento Chamical, 702 †
 Vallentin, Dr. Wilhelm (Biography), 590 †
 Vallot, J. et H., Un projet de chemin de fer du pied au sommet du Mont-Blanc, 360 †
 Valparaiso, von J. Hermann, 490 †
 Van der Stok, Dr. J. P., Een nieuwe regeekaart van Java, 697 †
 Vannutelli, L., Un' escursione nel Ceking settentrionale, 486 †
 Vasco, G., L'Arbitrage Anglo-Vénézuélien, 254 †; Sahara: Le mission Fourcau-Lamy, 700 †
 Vassel, E., Le lac de Bou-Grara et la pénétration, 370 †
 Vaudoux ceremonies at Haiti, 315
 Vaulserre, Vicomte de, Le Fleuve Bleu de Sui-fou à la hauteur de Tali-fou, 247 †
 Vaux, G. and W., Additional Observations on Glaciers in British Columbia, 252 †; note on, 687; The Great Glacier of the Illicilliwaet, 125 †
 Vea, Antonio de, voyage of, 19
 Vedova, Prof. G. D., (Biography of) Giovanni Marinelli, 495 †
 Veeren, F. E. L., De beteekenis van de wateren der aarde als drinkwater, 376 †
 Velten, C., Erklärung einiger ostafrikanischer Ortsnamen, 488 †; Sitten und Gebräuche der Suaheli, 488 †
 Venetia—
 Della linea e dei fiumi di resorgiva in relazione al territorio veneto, del Prof. G. L. Bertolini, 572 †
 Venezuela—
 Anglo-Venezuelan Boundary Dispute, by Marcus Baker, 254 †

- Venice, Trade of (Foreign Office Rep.), 244 †
 Vénukoff, M., De l'état actuel du Turkestan Russe, 248 †
 Veitbeck, Dr. P., William Dampiers Leben und Werke, 494 †
 Verkhojansk ridge, geology of, 95
 Verney, N., et G. Dambmann, Les puissances étrangères dans le Levant, 579 †
 Verrazzano e Florin, Ancora sulla distinta personalità di, del P. Peragallo, 259 †
 Verrill, A. E., Notes on the Geology of the Bermudas, 125 †
 Vespucci, Amerigo, Una lettera di Henry Harriase, 133 †
 Vesuvius, Photographs showing eruption of, by Prof. R. V. Matteucci, 264 †
 Viala, L. F., Un Voyage en Espagne, 121 †
 Victoria Land, Antarctic, 383, 400
 Victoria Nyanza, A Journey to the, by Captain G. H. Gorges, 78 †
 Viedma, Antonio, journey in Patagonia, 21
 Vienné, E., Notice sur Mayotte et les Comores, 699 †
 Vignon, L., L'exploitation de notre Empire colonial, 495 †
 Vincent, Dr. J., Réforme de l'Enseignement de la Géographie, 375 †
 Vinson, M., Le port et le quartier maritime d'Antibes, 570 †
 Vivien de Saint Martin, M., et F. Schrader, Atlas Universel de Géographie, 711 †
 Volcanic Phenomena—
 Phénomènes volcaniques dans leurs rapports avec l'océanographie, par J. Thoulet, 705 †
 Volossovitch, K. A., Expedition to New Siberia, 232, 567
 Von der Lage, Bertha, Ferienreisen und Studien, 592 †
 Vries, J. H. de, Reis door eenige eilandengroepen der Residentie Amboina, 697 †

W.

- WADDELL, Major L. A., The Physical Types . . . of the Wild Tribes of the Brahmaputra Valley, 247 †
 Wagner, Dr. Hermann (Biography), von W. Sievers, 259 †; Geographisches Jahrbuch, 376 †
 Wakhan range, Shugnan, 670
 Walamo district, Abyssinia, 297
 Walder, Prof. Dr. E., Heinrich Zeller-Horner (Biography), 133 †
 Wales—
 Bala Lake and the river system of North Wales, by P. Lake, 364 †
 North, River System, Mr. Philip Lake on the, 679
 Thorough Guide Series; South Wales, etc., by C. S. Ward and M. J. B. Baddeley, 574 †
 Walker, B. E., Canadian Surveys and Museums, 489 †
 Walker, J. B., The Cartography of the Terra Australis and New Holland, 590 †
 Walker, T. L., A Geological Sketch of

- the Central Portion of Jeypore Zemindari, 487 †
- Wallace, R., The Garton Lectures on Colonial and Indian Agriculture, 707 †
- Wallis, H. S., George James Symons (Biography), 133 †; British Rainfall, 1899..695 †
- Walsh, Canon P., on the Future of the New Zealand Bush, 108
- Walters, Captain H. F., The Operations of the Malakand Field Force, 697 †
- Walton, Joseph, China and the Present Crisis, 696 †
- Wandorobo tribe, 78
- War maps, by Colonel Sir T. H. Holdich, 492 †
- Ward, C. S., and M. J. B. Baddeley, Thorough Guide Series, South Wales, etc., 574 †; North Devon and North Cornwall, 574 †
- Warner, G. F., The Voyage of Robert Dudley . . . to the West Indies, 491 †
- Warundi tribe, Central Africa, 559
- Washington and District of Columbia, List of Maps and Views of, by P. L. Phillips, 253 †
- Washington, Cape, Antarctic, 397
- Water-bottle, The Pettersson-Nansen Insulating, by H. R. Mill, 469
- Watermeyer, J. C., Notes on a Journey in German South-West Africa, 368 †
- Water-supplies—
De betekenenis van de wateren der aarde als drinkwater, door F. E. L. Veeren, 376 †
- Waterway from the Baltic to the Black Sea, 554
- Watson, Colonel, remarks on "King Menelek's Dominions," etc., 305
- Watson, T. L., Some Notes on the Lakes and Valleys of the Upper Nugsuak Peninsula, 256 †
- Watusi tribe, Central Africa, 169
- Wauters, A. J., La région des concessions dans le bassin de la Sanga, 250 †; La Sanga, 250 †; Le problème du Wam, 250 †; Les sources du Congo, 580 †
- Wauwermans, Lieut.-General, La conquête des Poles, 128 †
- Weatherley, P., observations on Lake Mweru, 475
- Weber, S., (Biography of) G. F. von Berzevichy, 590 †
- Weber, Prof., *Siboga* Deep-sea Expedition under, 111, 549
- Webster, Commander H., China and her People, 575 †; Korea—the Hermit Nation, 248 †
- Weeks, F. B., Bibliography and Index of North American Geology, Paleontology, etc., 489 †
- Weigand, Prof. G., Die Rumänen in Serbien, 245 †
- Weill, R., L'art de la fortification dans la haute antiquité égyptienne, 367 †
- Weingerber, Dr., Études géographiques sur le Maroc, 369 †
- Weiss, Dr. E., und Dr. R. Schram, Astronomische Arbeiten des k. k. Gradmessungs-Bureau, 483 †
- Wellby, Captain M. S., King Menelek's Dominions and the Country between Lake Gallop (Rudolf) and the Nile Valley, 292 *, 698 †; Obituary of, 358
- Weller, C. L., Photographs of Sierra Leone, 712 †
- Wells, A. F., Map showing the Route and Discoveries of the Calvert Exploring Expedition in Western Australia, 379 †
- Wenzel Lake, crater lake, Central Africa, 561
- Westerlund, F. W., Sjölförmorden i Finland 1861-1895..363 †
- West Indies—
Colonies Néerlandaises dans les Indes Occidentales, par C. M. Kan, 372 †
Dänemarks westindische Besitzungen, 491 †
Plantae Utowanae, Plants collected in the, by C. F. Millsaugh, 702 †
Voyage of Robert Dudley, etc., edited by G. F. Warner, 491 †
- Westphal, Dr. A., Das Mittelwasser der Ostsee bei Travemünde, etc., 484 †
- Whaling—
Gegenwärtige Eismeerfischerei und der Walfang, von Hegemann, 128 †
- White, D., Fossil Flora of the Lower Coal Measures of Missouri, 583 †
- White, J. D., The Log-book of Hanno, 590 †
- White, Sir W. H., Presidential Address on Steam Navigation, 259 †
- White Volta river, Gold Coast, 683 *
- Whymper, Ed., A Letter addressed to the Members of the Alpine Club, 376 †; Chamonix and the Range of Mont Blanc, 119 †; Scrambles amongst the Alps in the years 1860-69..569 †; The Valley of Zermatt and the Matterhorn, 121 †
- Wichmann, Prof. Dr. A., Die Mapia- oder Bunai-Inseln, 127 †; De Doif-eilanden, 366 †
- Widenmann, A., Eine Kilimandscharo-Besteigung bis zu 5500 m. Höhe, 488 †
- Wiedemann, Prof. Dr. A., A Mythological-Geographical Text, 494 †
- Wiesel, C., Das Sornitzgebiet, physisch-geographische Skizze, 243 †
- Wiik, F. J., Om de primitiva formationernas geologi . . . till Finlands, 363 †
- Wild, H., Ergänzungen zu meinem magaeetischen Reise-Theodolith, etc., 256 †
- Wilkin, A., Among the Berbers of Algeria, 699 †
- Willson, G. H., and A. G. McAdie, The Climate of San Francisco, California, 126 †
- Wilson, H. M., Porto Rico: its Topography and Aspects, 491 †
- Wilson, Sir C. W., Handbook for travellers in Constantinople, etc., 574 †; The Dead Sea, 698 †

Winds—

- Influence of, on the Level of Lake Erie, Prof. A. J. Henry on, 685
 Variations in the Velocity of Winds, by S. Lemström and J. Dannholm, 588 †
Windward, Voyage of the, 357, 566
 Wingate, Captain A. W. S., "Things Chinese," 122 †
 Wissmann, Major, remarks on "Through Africa from the Cape to Cairo," 184
 Wit, Augusta de, Facts and Fancies about Java, 123 †
 Witte, E., Das kalte Küstenwasser, 130 †
 Wittenoom, Hon. E. H., Western Australia in 1899, 128 †
 Woelfel, Prof. A., Alexis v. Tillo (Biography), 133 †; Climat des Hauteurs de l'Europe occidentale, 257 †; Klima von Luktshun, Centralasien, 365 †; Luftdruck und die Atmosphärische Cirkulation in Asien, 247 †; Wo ist der höchste Luftdruck der Erde, mit und ohne Reduktion auf das Meeresniveau? 374 †
 Wolkenbauer, Prof. Dr. W., Geographische Nekrologie für die Jahre 1898 und 1899, 132 †; Die Entwicklung der Geographie im xix Jahrhundert in einigen Merkszahlen, 260 †
 Wood and Ortlepp, Messrs., Map of the Northern Portion of the Transvaal, 378 †
 Woodhouse, Mr., on the Waterway from the Baltic to the Black Sea, 555
 Workman, F. B., and W. H., In the Ice-World of Himalaya, 577 †; note on, 681
 World—
 Journey with the Sun around the, by W. McMahon, 592 †
 Maps: Erdumrisskarte in flächentreuer Planisphäre, von A. Bludau, 137 †
 Production de la soie dans le monde, par M. V. Groffier, 131 †; note on, 357
 Silver Map of the, by Miller Christy, Note on, 113
 Worsfold, W. Basil, The Redemption of Egypt, 367 †
 Wragge's Australasian Almanac and Weather Guide for Land and Sea, 585 †
 Wrong, Prof. G. M., and H. H. Langton, Review of Historical Publications relating to Canada, 252 †
 Wuchow, Trade of (Foreign Office Rep.), 247 †
 Wuhu, Trade of (Foreign Office Rep.), 576 †
 Wüllerstorff und Urbair, Bernhard Freiherr v. (Biography), 590 †
 Württemberg—
 Württembergisches Urkundenbuch, 244 †

Y.

YANG-TSE—

- Ausflug nach den Yangtze-Grotten, von Dr. H. Betz, 486 †
 Mündung des Yangtze-Kiang, 576 †
 Yangtze Valley and the British Sphere, by A. J. Little, 247 †

Yate, Major A. C., Sixty Years of Frontier Warfare, 247 †

Year-book—

- Statesman's Year Book, by J. Scott Keltie and I. P. Renwick, 134 †
 Yelcho, Rio, Patagonia, 191, 194
 Yeld, G., Scrambles in the Eastern Graians, 483 †
 Yellowstone National Park, Geology of the, by A. Hague and Others, 584 †
 Yermak, Ice-breaker, by Vice-Admiral Makaroff, 260 †
 Yeshil Kul, Pamirs, 99, 143
 Yezidi ou les adorateurs du Diable, par J. Spiro, 124 †
 Yokohama, Trade of (Foreign Office Rep.), 578 †
 Yoruba—
 In Yorubaland, Journal of the Rev. T. Harding, 251 †
 Young, C. H., Peloponnesian Journeys, 244 †
 Yucatan—
 Biologia Centrali-Americana, Archaeology, by A. P. Maudslay, 372 †
 Yukon—
 Basin of the Yukon River, by J. B. Tyrrell, 370 †
 Ice-Cliffs on White River, by Martin W. Gorman, 125 †
 Ice-Cliffs on White River, Yukon Territory, by C. W. Hayes and A. H. Brooks, 371 †
 Yung-peh, Sechuen, 534

Z.

- ZACHARIE, Gen.-Major G., Præcisions-nivellementet over Øresund, 129 †
 Zambezi—
 Source of the, Major Colin Harding's Expedition to the, 349
 Zambese et le Shire, par M. Levêque, 369 †
 Zanzibar, Der Obstreichthum der Insel, von G. Neuhaus, 487 †; Zanzibar, Trade of (Foreign Office Rep.), 699 †
 Zarafshan river, 519
 Zeller, Dr. R., Aus dem algerischen Atlasgebirge, 579 †
 Zeller-Horner, Heinrich, von Prof. Dr. E. Walder (Biography), 133 †
 Zemjatschensky, Prof. P., Untersuchungen über Geologie und Bodenverhältnisse im Kreise Borowitschi, 573 †
 Zemmrich, Dr. J., on the Germans and Czechs in North-West Bohemia, 553
 Zermatt, Valley of, and the Matterhorn, by Ed. Whymper, 121 †
 Zimmermann, Prof. M., Lyon et la Colonisation française, 484 †
 Zimmermann, M., Le sort de l'expédition Andrée, 586 †
 Zuai, Lake, Abyssinia, 296
 Zuccato, —, Trade of Venice, 244 †
 Zukwala: see Sakwala
 Zwemer, Rev. S. M., Arabia: The Cradle of Islam, 574 †

INDEX TO MAPS.

EUROPE.

- | | |
|---|---|
| England, Matthew Paris' Map of, final form, 321 | Macedonia and Southern Albania—
Prespa, Lake, 216; Ochrid, 217 |
|---|---|

ASIA.

- | | |
|--|---|
| Afghanistan and Baluchistan, Orographical Map of, 596, 682 | Malay Archipelago, Bathymetric Chart of the, 550 |
| Borneo, North, Baram District, 140 | Siberia— |
| Calcutta and Lower Ganges Region, Sketch-map, 239 | Ob and the Irtysh, Dr. Janko's route between the, 847 |
| China, South-Western, illustrating journey of E. Amundsen, 596 | Tibet and Sin-Chiang (Chinese Turkestan), showing Captain Deasy's surveys 596 |

AFRICA.

- | | |
|--|---|
| Addis Abeba to the Sobat river, Sketch-map of Captain Wellby's journey from, 380 | North-East, Map to illustrate Explorations in, 712 |
| Assyut. Oases of, Sketch-map, 656 | Sikait District, Sketch-map showing position of Emerald Mines, 538; Plan of Jebel Sikait, 540; Cross-section of Sikait, 596; Survey of route from Um Selim to Sikait, 596 |
| Central: Sketch-map of Region between Tanganyika and Albert Edward Nyanza, 264 | West: Franco-Spanish Boundaries Sketch-maps of, 226 |
| Dinka Country, Swamps of the, Sketch-map, 181 | |
| Naivasha, Lake, to Victoria Nyanza, Sketch-map illustrating a journey from, 140 | |

AMERICA.

- | | |
|---|--|
| Chesterfield Inlet to Great Slave Lake, Sketch-map, 140 | Patagonian Cordillera, Sketch-map of the 140 |
|---|--|

ANTARCTIC.

South Victoria Land, Part of the coast-line of, 500

ARCTIC

Greenland, Sketch of the course of the *Antarctic*, 662

AUSTRALASIA.

- | | |
|---|--|
| New Guinea, British— | New Guinea, British— <i>continued</i> . |
| Distribution Sketch-maps; Cephalic index of over 78..289; Initiation ceremonies, etc., 418; Houses, 423; Canoes, 426; Bow and arrow, etc., 428; Decorative art, 430 | Linguistic map of Central district, 438
Mekeo district, Geological Sketch-map of the, 268; Sketch-map of the, 272
Rigo district, Sketch-map, 285
Sketch-map of, 267 |

GENERAL.

- | | |
|---|---|
| Diogo Cao and Bartholomeu Dias. Maps illustrating the Voyages of, 712 | Medieval maps:—Matthew Paris' map of England: final form, 321 |
|---|---|

ILLUSTRATIONS AND DIAGRAMS.

ASIA.

- Borneo—
 Dayak Gutta hunters, 57
 Kayan district, Jungle in the, 43
 Limestone cave, haunt of the swifts, 41
 Madangs on a jungle path, 45
 Madangs shooting with the Keleput (blowpipe), 49
 Madang tomb, 47
 Punans at home, 53
 Warriors prepared for the *Jawa*, 50
 Calcutta—
 Geological section from supposed ancient crater to Calcutta and on to Kerpo, 240
 Central Asia—
 Asgan Sal Valley. Peculiar formation in, 161

- Central Asia—*continued.*
 Glacier near Nabo La pass, 151
 Glaciers near sources of Kiria river, 509
 Hunza, Difficult part of route through, 155
 Khotan river, General view of sources of, 513
 Kwen Lun range, View of, 505
 Raskam, Scene in, 159
 Snow bridge on Dras river, 143
 Tibet, Camp scene in, 147
 Yarkand river, The most westerly bend of, 517
 Persian gulf—
 Mausolea near Bandar 'Abbas, 212

AFRICA.

- Africa, from Tanganyika to Albert Edward Nyanza—
 Geysers, Albert Edward Nyanza, 175
 Ruwenzori, from the west, 179
 Volcanoes from Lake Kivu, 167
 Volcanoes, Mount Gützen and Mount Sharp, 171
 Assyut. Oases of—
 Er Ramlah el Kabir, on the Assyut road to Kharjah, 657
 Kasr Dakhil, General view of, 660
 Kharjah, Oasis of, 658
 Mut, Town of, Oasis of Dakhilah, 659
 Smint el Kharab, ruined temple, 661
 Etbai, Northern—
 Abbadi native, 545, 546
 In the Desert: Halfway to the mines, 539
 Roman hill, Jebel Sikait, plan and cross-section, 542
 Shrine in the hills between Wadi Nugrus and Wadi Sikait, 544

- Etbai, Northern—*continued.*
 Sikait, Jebel, from the west, 541
 Sikait, Jebel, View of wadi from, 543
 Naivasha Lake to Victoria Nyanza—
 Kach village, 86
 Native bridge, 88
 Sotik head-dresses and girl's apron, 82
 Sotik hut, 84
 Sotik spears and knives, 81
 Rudolf, Lake, and the Nile—
 Bad Lands, near Laki, east of Lake Stefanie, 605
 Cedar valley, 612
Gazella Grantii Brightii, 607
 Magois youth, 613; Near Magois, 615
 Mursu on the river Omo, 610
 Nile at Fort Berkeley, 623
 Omo at Mursu, On the, 603
 Raffia palms, country of the Akara, 617
Tragelaphus Bor (Heuglin), 619

AMERICA.

- Haiti—
 Turglan, Road to, 311
 Patagonian Cordillera—
 Aisen river near its mouth, 187
 Alauzo river, Narrows of, 25
 Alauzo river, Valley of, near its junction with Puelo valley, 21
 Baker channel from a harbour in its central part, 195
 Baker river in its lower course, 199

- Patagonian Cordillera—*continued.*
 Chubut river in Alaiten valley and the water-parting Cordilleran ranges, 29
 Cisnes river, 10 miles from mouth, 33
 Cisnes valley, Central, Primæval forest in the, 37
 Mañuales river near its origin, 191
 Osorno volcano, from a lava-field near Lake Todos Los Santos, 17
 Pascua river and lagoon, 203

ANTARCTIC.

- Antarctic—
 Adare, Cape, in winter time, 384
 Dugdale glacier, 389
 Geikie Land, Part of the medial moraine in, 394
 Iceberg, A typical antarctic, 399
 Reindeer moss (lichen), 395

- Antarctic—*continued.*
 Ridley camp after the first snow-drift, 387
 Starfish found in 20 fathoms at Cape Adare, 392
 Thermometer screen, 385

ARCTIC.

Greenland—

Christiansen, Cape, 664
 Garde, Cape, on Blossonville coast,
 663

Greenland—*continued.*

Kaugerdlugsuak, View from the north
 side of, 665; Small glacier east of,
 666

AUSTRALASIA AND PACIFIC ISLANDS.

New Guinea, British—

Bull-roarer and ceremonial masks from
 Karama, Papuan gulf, 420
 Canoe carved with heads of the frigate
 bird, Massim region, 433
 Carved wooden belt, Papuan gulf, 431,
 434
 Club, and dancing shield, carved
 designs, 435
 Drum from the Fly river, foliar
 decoration of a, 432
 Drums from Daudai, with animal and
 plant designs, 432
 "Fulaari," or masked executive of the
 Taboo, Waima, Mekco district, 419
 Gaile natives, Motu stock, 279

New Guinea, British—*continued.*

"Geometric" patterns on a wooden
 comb from Mer, Torres Strait, 431
 Houses in coconut grove, Nada, 424
 Kalo village, 287
 Koiari men of the village of Makabiri,
 291
 Mer (Murray islands), The last round
 house in, 422
 Pottery-making at Hanuabada, Port
 Moresby, 429
 Shield and ceremonial or magical tablets
 from the Papuan gulf, 434
 Tree house, Gasiri, Central district,
 283
 Wavy-haired boy, Sinaugolo, 270

GENERAL.

Auroral curves in the Antarctic and in
 Canada, 692

Cão's and Dias' Voyages—

Arms of Portugal up to 1485.. 628
 Coat-of-arms of D. Cão, 632
 Padrão of São Jorge, 630; Padrão of
 Cape Cross, 634; Padrão of B. Dias,
 642

Royal coat-of-arms, 1485.. 634

Land-forms—

Bending and warping of a lath loaded
 at the centre with a weight, 457
 Bending and warping of a lath sub-
 jected to end compressions, 458

Land-forms—*continued.*

Resultant wave-form, 468
 Sella mountain in the Dolomites,
 Portion of the eastern transverse
 arch of, 464; Portion of the western
 transverse arch of, 465
 Slabs in Schlern dolomite rock, pro-
 duced by cross-pressures, 463
 Wedges of Lower and Middle Trias
 above the plane of overthrust in
 Buchenstein valley, 462
 Pettersson-Nansen insulating water-bottle,
 470

END OF VOL. XVI.

1

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